

**MONITORING OF RARE PLANT POPULATIONS
ON THE CLEARWATER NATIONAL FOREST**

by

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**Cooperative Challenge Cost-share Project
Clearwater National Forest**

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ABSTRACT

Plant population monitoring is part of the botany program on the Clearwater National Forest. Monitoring augments rare plant surveys in providing information needed to manage rare plant species. Specific objectives vary with each monitoring project. Six separate population monitoring projects have been carried out under challenge cost-share agreements between the Clearwater National Forest and the Idaho Conservation Data Center (CDC). A summary of results from four of these projects was reported in Lichthardt (1997). The current report covers three monitoring projects for which data were collected in during the 1997 field season: Aquarius RNA, Constance's bittercress, and Big Smith timber sale. For each project, the purpose of monitoring is specified, a simplified summary of the data is presented, a brief interpretation is given, and recommendations are made. In addition, cumulative, raw data sets are included in the appendices. For two of the projects, datafiles on disk are included with copies of this report to the Clearwater National Forest and the CDC. Recommendations are made for proceeding with the rare plant monitoring program on the Clearwater National Forest.

CONTENTS

ABSTRACT	i
CONTENTS	ii
LIST OF TABLES	iii
LIST OF FIGURES	iii
LIST OF APPENDICES	iv
INTRODUCTION	1
AQUARIUS RNA	2
Clustered lady's-slipper orchid.....	3
Henderson's sedge	3
Methods	3
Results.....	4
Recommendations	5
CONSTANCE'S BITTERCRESS-NORTH FORK DISTRICT	6
Methods.....	6
Habitats	7
Results	7
Recommendations	8
BIG SMITH TIMBER SALE.....	9
Methods.....	9
Results	10
Discussion and Recommendations.....	12
REFERENCES.....	14

LIST OF TABLES

Table 1. Plant population monitoring projects conducted on the Clearwater National Forest as challenge cost-share projects with the CDC	2
Table 2. A population of clustered lady's-slipper orchid over six years. R = reproductive individual; V = vegetative (or no fruits produced); - = plant not located. Plot 91JL010, Aquarius RNA.....	3
Table 3. Density and frequency of Constance's bittercress (<i>Cardamine constancei</i>) ramets over two years in different forest cover types.....	8

LIST OF FIGURES

Figure 1. Numbers of vegetative and reproductive Henderson's sedge plants (genets) over seven years. Plot 91JL008.	4
Figure 2. Presence and reproductive status of <i>Carex hendersonii</i> plants over five years, in logged and unlogged (control) plots. Plot 6 was logged just prior to the 1994 data. Each horizontal line represents a single plant. -- indicates a vegetative condition, and - a reproductive condition. nd = no data.....	11

LIST OF APPENDICES

Appendix A. Maps of monitoring plot locations

- Map 1 Monitoring plots in Aquarius RNA for clustered lady's-slipper orchid and western starflower (91JL010), Henderson's sedge (91JL002), and Constance's bittercress (91JL002 and 95JL011)
- Map 2 Constance's bittercress plot 1–Dog-salmon clearcut
- Map 3 Constance's bittercress plot 12–Larson Creek
- Map 4 Big Smith timber sale—monitoring plots for Henderson's sedge

Appendix B. Aquarius RNA: Plot diagrams

Appendix C. Constance's bittercress: Plot diagrams

Appendix D. Big Smith timber sale: Plot diagrams

Appendix E. Datafiles

INTRODUCTION

The National Forest Management Act and Forest Service policy require that Forest Service lands be managed to maintain viable populations of all existing native animal and plant species at or above the minimum viable population level. Each Region has developed a list of sensitive species that require special attention because of their rarity. Land managers faced with protection of these species are hindered by a paucity of information on which to base decisions. Questions about the causes of rarity, optimum habitat, and response to land management practices cannot be answered by casual observation, and therefore some level of monitoring is needed (Sutter 1986).

The Idaho Conservation Data Center (CDC) has primary responsibility for seven projects that monitor sensitive plant populations on the Clearwater National Forest (Table 1). Periodic reports have been submitted for each project and are on file at the Clearwater National Forest Supervisor's office and the CDC office in Boise. During 1997, data were collected for four of these projects (1, 2, 4, and 7; Table 1). This report summarizes cumulative data for projects 1, 2, and 4 and makes recommendations. Results from project 7, demographic monitoring of Pacific dogwood, are reported elsewhere (Lichthardt 1998).

The objectives of monitoring vary among projects, but in general the goal is to understand the behavior of specific sensitive species so that informed decisions can be made about their management. With regard to the three projects reported here, population monitoring plots in Aquarius RNA are part of baseline ecological monitoring specified in the *Implementation Plan for Management and Monitoring* for Aquarius RNA (Lichthardt 1995) and serve as controls for other monitoring projects; monitoring of Constance's bittercress (*Cardamine constancei*) was recommended as part of a conservation strategy for the Clearwater refugium ecosystem (Lichthardt and Moseley 1994); and monitoring was established on the Big Smith timber sale to detect any effects of timber harvest on populations of Henderson's sedge (*Carex hendersonii*).

For each project, maps of plot locations and diagrams of plot layouts are included as appendices. All data for Aquarius RNA and Big Smith timber sale have been entered in a datafile, and are stored in ASCII format at the CDC. For detailed methods see specific reports cited in the text.

The Idaho CDC maintains an Ecomonitoring database that stores and tracks information on plant population monitoring throughout the State. All monitoring projects on the Clearwater National Forest have records in the database. An Ecomonitoring report form should be submitted each time plant population data is collected. These reports are then used to update computer records which show plots monitored, the date of monitoring, and where data were reported and stored. The report form can also be used to record any changes or clarification of the methods used. The database does not contain monitoring results but indicates where they are stored.

Table 1. Plant population monitoring projects conducted on the Clearwater National Forest as challenge cost-share projects with the CDC. Element occurrence numbers follow plant common names.

Project	District	Plant species monitored	Years of monitoring
1. Aquarius RNA	3	Clustered lady's-slipper orchid (038), Western starflower (004), Henderson's sedge (001), and Constance's bittercress (029)	Annually, 1991 to 1997
2. Constance's bittercress	3	Constance's bittercress (025, 029, and 088)	1995, '96, '97
3. Steep Creek timber sale	3	Henderson's sedge (031) Crinkle-awn fescue Western starflower (005)	1992, '94, '96
4. Big Smith timber sale	5	Henderson's sedge (026)	Annually, 1993 to 1997
5. Apgar campground	5	Clustered lady's-slipper orchid	1988 & 1994
6. Bank monkeyflower	5	Bank monkeyflower	1989, '90, '91
7. Pacific dogwood	5	Pacific dogwood	1991-'93, '95, '97

AQUARIUS RNA

In 1991, four monitoring plots were established in rare plant populations within Aquarius RNA (Lichthardt 1992). Each plot has been used to monitor 1 to 3 plant species. Plot 91JL011¹ for crinkle-awn fescue (*Festuca subuliflora*) was only visited from 1991 to 1993, but the transect is still marked. Plot 91JL002 for Constance's bittercress (*Cardamine constancei*) was monitored for five years, then terminated when the site became part of an expanded monitoring program for Constance's bittercress. Data from these two plots are presented in an earlier report (Lichthardt 1997). Two other plots, one for clustered lady's-slipper orchid (*Cypripedium fasciculatum*; 91JL010) and one for Henderson's sedge (*Carex hendersonii*; 91JL008) have been monitored annually for seven years and results are reported here. Plot locations are shown in Appendix A, Map 1.

¹ Plot numbers are the last seven digits of the Ecodata key ID number.

Clustered lady's-slipper orchid (Plot 91JL010)

In this plot, a population of clustered lady's-slipper orchid, ca. 0.1 acre in extent is monitored by tracking individual plants (genets). A circular plot is marked with a centerpost and plants are mapped by distance and azimuth from the post (Appendix B, Figure 1). In addition, plants are marked and numbered on the ground with metal spikes. Other data collected include number of ramets per genet, number of fruits per genet, and plant height (Appendix E). The plant community context of the plot is documented by Ecodata plot No. FS01030591JL010.

Table 2 follows individual orchid plants over seven consecutive years, showing whether they were reproductive (R) or vegetative (V) in each year. Out of six original plants, only one has produced aerial growth for seven consecutive years. In six instances individuals were dormant for a single season, and in one instance an individual was dormant for two years. There is no evidence as yet for dormancies longer than this. Although plants can produce multiple stems, this has happened only once over the course of monitoring. In 1997 the plot was disturbed by windthrow; there was a large amount of small-diameter debris in the plot and several trees in the vicinity went down, opening the canopy slightly.

Table 2. A population of clustered lady's-slipper orchid over seven years. R = reproductive individual; V = vegetative, or no fruits produced. - = plant not located. Plot 91JL010, Aquarius RNA.

Genet No.	Reproductive status						
	1991	'92	'93	'94	'95	'96	'97
1	R	-	V	R	R	R	*
2	R	R	R	R	-	R	R
3	R	R	R	R	R	R	R
4	R	R	R	R	-	-	-
5	R	R	R	R	-	-	V
6	R	-	R	R	-	R	R
7			R	V	V	R	R
8			V	V	R	-	V
9				R	R	-	R

* Location buried under windthrow debris.

Henderson's sedge (Plot 91JL008)

Plot 91JL008 was established in 1991 for permanent monitoring of an example of the western redcedar/*Dryopteris* spp. habitat type (Steele 1971) and a population of Henderson's sedge. The site is a level terrace of the North Fork. The sedge population was identified as a "source" population in Lichthardt and Moseley (1994). A source population is considered a stable, core population that theoretically provides a seed source to maintain outlying ephemeral populations (Pulliam 1988).

Methods. A feature of this population, that seems to be characteristic of Henderson's sedge populations in general, is that plants tend to occur in rather discrete colonies, in this case generally less than 0.25 m². Colonies are mapped using the distance and azimuth from a centerpost that also serves to mark a 37-ft radius Ecodata plot. For each colony, the

number of genets, number of ramets per genet, and number of inflorescence-bearing ramets per genet are recorded. It was originally thought that a radius of 45 ft encompassed the entire population, but in following years plants were found further out, and 45 ft became an arbitrary limit. A map of the plot with locations of all plants found to date is included in Appendix B, Figure 2.

Results. Seven consecutive years of data are contained in Appendix E. Figure 1 shows the number and reproductive status of genets over time. Individual genets within a colony were not marked, so we cannot track the presence or reproductive status of individual plants.

Within the approximately 0.1-acre plot, the number of colonies more than doubled between 1991 and 1992 (Figure 1). However, ten of the new colonies did not persist into 1993, resulting in only a small net increase. In 1994 there was again a sharp increase, but this time nearly all of these colonies or individual plants persisted into 1996. I strongly suspect that some plants were overlooked in '91 and '93 because a plot map was not taken to the field. In 1995 plants were marked with stakes, which is certain to have increased the accuracy of data collection.

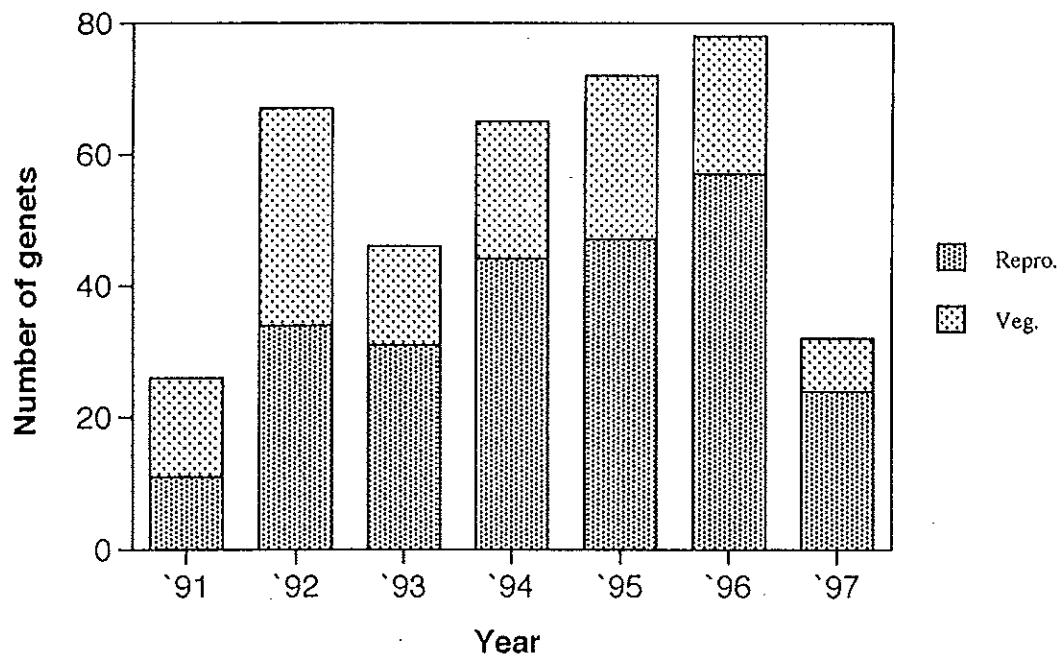


Figure 1. Numbers of vegetative and reproductive Henderson's sedge plants (genets) over seven years. Plot 91JL008.

In 1997 a severe wind event occurred in the North Fork Canyon above Dworshak Reservoir—the second such event in 4 years. This one knocked out many small groups of trees and some areas of 1 to 2 acres. On the river terrace where plot JL008 is located, several very large trees were knocked down within and adjacent to the plot, miraculously avoiding the centerpost. At the time the plot was visited, much of the fern understory (about 60% of the plot) was still flattened down. Many of the marked Henderson's sedge plants were buried under woody debris. The canopy is now much more open directly overhead.

Overall, the data set shows a large fluctuation in numbers of plants over time, pointing to successful establishment from seed, at least in the limited area of the population, where habitat appears to be optimum. The sudden appearance of new colonies of large plants (e.g., 19, 21, 27, and 37) is troubling, indicating that plants were probably missed at times. Data indicate that first-year plants can be reproductive. The complete data set also includes the number of ramets per genet (Appendix E) which is an index of size and vigor of a plant.

Through 1996 this population appeared to be persistent and expanding, supporting our previous interpretation of optimum habitat for this species (Lichthardt and Moseley 1994). By comparison, less vigorous populations are found in marginal habitat such as that monitored in the Big Smith timber sale (page 9). I recommend reading this plot again about three years out (2000) once the population has stabilized somewhat from the disturbance. Important comparisons could be made by establishing several plots in nearby populations representing marginal habitat.

Recommendations

Population monitoring in *Aquarius* would benefit from replication at additional sites, so that we could assess to what extent patterns are parallel, or how they differ in different habitats. Field time required to read these plots is not great, but there is a significant amount of work in documenting and storing data.

Monitoring of the clustered lady's slipper plot (91JL010) should be continued, because orchids have the ability to remain dormant for a number of years, and patterns are only now becoming evident. Also, a range-wide conservation strategy is currently being written for this species and monitoring data from various portions of its range will be useful.

At plot 91JL010 there is also a transect for western starflower. Six years of measurements have already been reported (Lichthardt 1997). However, the plot serves as an additional control for logged plots of the Steep Creek timber sale, so I recommend revisiting that plot in conjunction with 1998 Steep Creek monitoring. The Constance's bittercress population at permanent plot 91JL002 (Lichthardt 1997) is now part of a replicated sampling design that includes another large population in the RNA, as well as populations outside the RNA (see following section).

CONSTANCE'S BITTERCRESS-NORTH FORK DISTRICT

Constance's bittercress (*Cardamine constancei*) is a rhizomatous forb of the forest understory that is endemic to northern Idaho. It occurs in scattered populations in the North Fork Clearwater canyon, all under two acres in extent. A picture of the optimum habitat for this species has evolved slowly through field observations. Crawford (1980) observed that flowering of Constance's bittercress is induced by opening or removal of the tree canopy. Although flowering is rarely observed under closed-canopy conditions, plants flower profusely after both ground and canopy fires. However, fruit and seed production are thought to be low. Crawford hypothesized that seed production requires a combination of light and moisture that occurs infrequently. Under closed canopies, vegetative spread by rhizomes must maintain a population until canopy openings arise through windfall, decadence, or fire.

During a 1994 survey of the Clearwater Canyon Refugium (Lichthardt and Moseley 1994), the most vigorous populations of Constance's bittercress were found in mid-seral stands. At the same time, a portion of one population was found in unit 7 of the Dog-Salmon timber sale, which was clearcut in 1993. It is assumed that the open conditions of a clearcut would have adverse effects on the population which might not persist under such conditions.

If optimum habitat conditions can be identified, inferences can be made about the role of forest processes in population viability. This information can then be used to guide management decisions affecting the species. Assuming that populations in optimum habitat would have the highest density and rate of vegetative spread, monitoring can be used to identify optimum habitat.

In order to compare trends in Constance's bittercress populations in contrasting habitats, permanent transects were established at four sites in 1995 (Appendix A). Habitats include the 1993 clearcut (Dog-Salmon), a mid-seral western redcedar/queencup beadlily habitat type dominated by medium grand fir (Larson Creek), late-seral western redcedar/queencup beadlily (Aquarius-north), and old-growth western redcedar/*Dryopteris* spp. (Steele 1971; Aquarius-south).

Methods

Four populations of Constance's bittercress, in contrasting covertypes, were chosen for monitoring. At each site, a rectangular macroplot was defined which encompassed all, or a large portion, of the local population. If it was impractical to include the entire population, the macroplot was located on an area of continuous slope, aspect, and cover type, which contained the bulk of the population. Macroplots were therefore variable in size. One dimension was parallel with the slope contour and the other with the slope (Appendix C).

Starting points of three transects were randomly located along one side of the macroplot, generally moving from up to down slope. Transects extend the length of the macroplot, from left to right when viewed from downslope, and run along the contour. The exception is plot 1 (clearcut). Because a slight swale runs through the middle of the population, transects were run down the slope so that the tape could be kept close to the ground. Stems (ramets) of Constance's bittercress were counted in 1 x 1 m contiguous microplots along each transect. In the rare case that a flowering or fruiting ramet was present, this was noted. Baseline data were collected in 1996 and plots were revisited in 1997. Field data sheets are on file at the CDC, in the Plant and Community Monitoring file. Plot diagrams can be found in Appendix C.

Habitats

Four populations were selected in contrasting habitats representing the entire range of seral stages of western redcedar forest. An Ecodata plot (Bourgeron *et al.* 1991) with canopy coverage data was done at each site. Data forms are on file at the CDC office in Boise.

Dog-Salmon clearcut (95CC001)—Plot is in a unit that was clearcut in 1993. Vegetation is now a dense growth of ferns, forbs, and low shrubs. The dominant fern is bracken fern (*Pteridium aquilinum*) and dominant shrubs are thimbleberry (*Rubus parviflorus*) and blackcap (*R. leucodermis*). The unit was stocked in 1996. Plot is in a slight swale on a 60% slope with a southeast aspect.

Larson Ck (95CC012)—Plot is in an approximately 60-year old mixed conifer stand including a small amount of paper birch (*Betula papyrifera*). There is a continuous tree canopy cover of greater than 80%. The stand represents a mid-seral stage of the western redcedar/queencup beadlily habitat type (*Thuja plicata*/*Clintonia uniflora*; Cooper *et al.* 1996). All trees are in dbh size classes less than 21 inches. The stand occupies a 70% slope between a ridgetop and the bottom of Larson Creek, with an aspect of 50 degrees. There are many small- and medium-diameter downed logs.

Aquarius North (95CC011)—This is a late-seral western redcedar stand on a steep (93%) slope on a west aspect between the River Trail and the North Fork Clearwater River. There is a subcanopy of pole and medium conifers². The habitat type is western redcedar/queencup beadlily.

Aquarius South (95CC002)—This plot is in a climax stand of western redcedar on a terrace of the North Fork. The site is effectively level. The habitat type is western redcedar/*Dryopteris* spp. (Steele 1971). The understory is dense mixture of ferns and there are large canopy openings.

Results

The low density of stems in the climax western redcedar stand (Table 3) is consistent with earlier observations that the most vigorous populations of Constance's bittercress occur in mid-seral stands (Lichthardt and Moseley 1994). The population in the clearcut is apparently still recovering from the logging/burn, or has possibly been stimulated by the post-burn nutrient flush.

Unfortunately plot 2, on the south side of Aquarius RNA, was not sampled in 1997 due to difficulty of access. A spring windstorm produced large amounts of blowdown along both sides of the river including the only place where it is possible to cross the cliffs opposite Isabella Landing. This plot can now only be reasonably accessed in mid-summer when you can walk the river's edge beneath the high-water line. A single transect monitored for five consecutive years at this site showed an increase in ramet density from 1.4 to 2.4 stems/m², with most of the increase occurring within one year.

² Pole = 5-9 inches dbh; medium = 9-21 in.; large = 21-33 in.

Table 3. Density and frequency of Constance's bittercress (*Cardamine constancei*) ramets over two years in different forest cover types.

Plot No.	Cover type	Transect Length m	-----1996-----		-----1997-----	
			Stems /m ²	Freq. %	Stems /m ²	Freq. %
1	Early-seral (clearcut)	15	2.1	47	4.9	58
12	Mid-seral	30	5.5	43	4.6	42
11	Late-seral	15	1.4	40	1.6	40
2	Climax	20	1.1	43	*	*

* No data for 1997.

Frequency was measured as the number of 1 x 1 microplots containing Constance's bittercress. This is not statistically accurate, since the microplots are in no way independent, but it is nonetheless a useful index of the spread of Constance's bittercress genets. An increasing number of microplots occupied is direct evidence of vegetative spread—an index of population vigor. The increased frequency of stems in plot 1 indicates that genets are spreading as well as producing more ramets.

Because flowering is rare, the number of transects used is insufficient to characterize or make comparisons of numbers flowering ramets. For example, although more plants were observed flowering in plot 1 than any other, only one flowering ramet was captured in a transect in 1996 and none in 1997. In 1996 one flowering ramet was also recorded at Larson Creek and two at Aquarius-north.

Because of the highly variable ramet density within a population, many more transects per site would be needed to attain a variance small enough to make statistically significant comparisons among sites. Instead, we intend to look for consistent, downward or upward trends within a site. The importance of the observed changes will have to be evaluated in a subjective way. The advantage of permanent plots is that we are looking at actual changes in plant density and spread.

Recommendations

Two more years of data might give a reasonable estimate of yearly variation and short-term trends. Then the plots could be left in place for monitoring 5 years out, to see if the trends have continued.

Since reproductive output is an important parameter determining the potential for colonizing new areas, some method should be devised to objectively describe the amount of flowering in different populations. Since at least a few flowering ramets can generally be found in the monitored populations, a sample of these should be marked and revisited to determine seed production and viability.

BIG SMITH TIMBER SALE

During clearance surveys for the Big Smith timber sale on the Lochsa District, the sensitive species Henderson's sedge (*Carex hendersonii*) was found in two cutting units. Because it was not known what the direct effects of logging would be on this species, monitoring was required by the environmental assessment for the project. The objective of monitoring is to detect changes in the affected populations following logging. Monitoring plots were established, and baseline data collected, in 1993 (except plot 1, which was set up in 1992). Plots were to be monitored yearly for five years following timber harvest. In 1995, the Idaho Conservation Data Center (CDC) assumed responsibility for monitoring. Interim reports were written following 1995 and 1996 field seasons (Lichthardt 1996, 1997).

Unit 15 was clearcut and broadcast burned in 1993, but unit 8 had still not been logged by early summer of 1997, severely limiting the amount of data on logged treatments. Unit 8 was finally logged in 1997, after the monitoring plots were visited. The prescription was for a clearcut with reserves. The unit is scheduled to be burned in spring of 1998.

Methods

In 1993, four monitoring plots (Nos. 2, 3, 6, and 7) were established around Henderson's sedge populations within proposed clearcut units 8 and 15, and four plots (Nos. 1, 4, 5, and 8) in nearby populations that would not be disturbed by logging (Appendix A). Plots are 25 x 25 ft and marked with steel fence posts at the north, east, and south corners and at the center. Prior to any logging, all Henderson's sedge plants within a 12-ft radius of the center post were mapped by azimuth and distance from the post and marked with wire flags (Appendix D). For each plant, the number of leaves, length of longest leaf, and number of culms (inflorescence-bearing stems) were recorded. In each following year, plants were relocated if possible, and any new plants were added to the map. Many of the flags were replaced with wooden stakes in 1996. Photos were taken of each plot, pre- and post-logging and are on file at the CDC.

The list of parameters measured was altered slightly after the CDC took over monitoring. From 1995 on, the number of ramets per plant was recorded. Ramets are the individual stems, or "tillers" that make up a sedge plant. A tiller that produces a seed head is a "culm". Ramets are easily counted, and give a good picture of the size and vigor of the plant. The number of leaves per plant was not measured after 1995.

Fence posts marking plot 7 were removed during timber harvest, making it necessary to renumber the plants. The plot was relocated approximately using landmarks, but individual plants could not be relocated because the centerpoint could not be accurately reestablished. Before logging, plants occurred in four distinct groups, designated A through D in the datafile (Appendix E). Post-logging, several of these were relocated with reasonable certainty, and plants were entered in the datafile using their group designation, actual plant numbers having no meaning except from 1996 and thereafter. In 1996 a new plot center was reestablished and plants or colonies were marked with wooden stakes.

Each monitoring site and associated plant community were described using Ecodata methods (USDA Forest Service 1991). Data are stored on Data General at the Clearwater National Forest Supervisor's office. Ecodata identification numbers for the monitoring sites are FS01050593KG006 (plot 1), 93KG004 (plot 2), 93KG005 (plot 3), 93KG003 (plot 5), 93KG002 (plot 6, preharvest), 94KG002 (plot 6, postharvest), 93KG001 (plot 7, preharvest), and 94KG001 (plot 7, postharvest). Hard copies are on file at the CDC in the Plant and Community Monitoring file. No Ecodata was taken for plot 4.

Results

Four to five years of data are documented in Appendix E (not all plots were read in 1992). Only the plots in the clearcut unit 15 (6 and 7) represent the effects of logging. Plot 6 is at the edge of unit 15, but is completely open overhead and to the south, and thus represents clearcut conditions. Plot 7 lies further within the clearcut. Since unit 8 was never harvested, plots 2 and 3 still serve as controls for the purpose of this report. However, plot 2 was subjected to natural disturbance by water and a falling tree.

A subset of the data is summarized in Figure 2 to compare logged vs. control plots. Figure 2 uses only data from plot 6 to represent harvested conditions, because individual plants could not be followed in plot 7.

Logged plots. *Plot 7:* Prior to logging (1993), the population consisted of four groups or "colonies" of Henderson's sedge plants. Plants were mostly small and vegetative. Even small plants will commonly have 10 ramets, and these had mostly one or two, based on the number of leaves recorded. In 1995, by approximating the location of the centerpost, it was determined that only groups A and D were still represented, and by 1997 only group A remained.

The population represented by plot 7 has changed amazingly little in overall profile, considering that many of the original plants do not appear to have survived the logging/burn. Prior to logging there were approximately twelve plants (genets) within the plot, five of which were reproductive. This figure may not be exact because stems growing close together can be part of the same genet. Four years after cutting, twelve, mostly different, plants were present, nine of which were reproductive. The population profile in 1997 was very similar to the original, with most plants being small and vegetative. Many of these plants may be seedlings.

Plot 6: The population in plot 6 has decreased slowly since logging and reproductive plants make up a much smaller proportion of the population (4/9 vs. 9/12; Figure 2). No new plants have established within the plot. In this plot individual plants were marked and followed. There was a greater than 50% decrease in number of Henderson's sedge plants in the year following logging (1994; Figure 2). Two years out, all but one of the original plants had returned, although only two produced seed. Pre-logging, nine plants had been reproductive. In each of the following years, one plant has been lost and the number of reproductive plants has increased only slightly.

Control plots. The purpose of control plots is to determine whether observed changes in populations subjected to logging could be due to random or natural fluctuations in population size. There was no change in number of plants in plot 1 over six years (Figure 2). Plot 3 lost one plant and gained one plant over five years, and plot 5 lost one plant and gained five plants over six years. There is no sign of plants going dormant for a growing season as there seems to be in plot 6, in the clearcut unit.

An interesting aspect of the control plots is that reproductive plants never become vegetative for more than one year at a time. Whereas in clearcut plot 6, four plants that were formerly reproductive have not produced seed for three or more years.

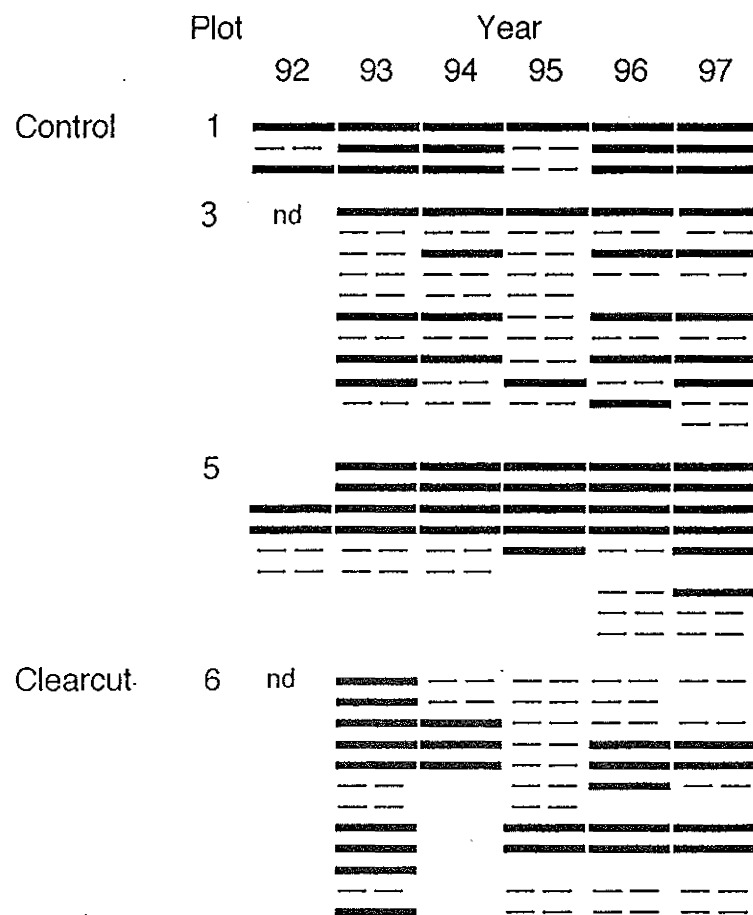


Figure 2. Presence and reproductive status of *Carex hendersonii* plants over five years, in logged and unlogged (control) plots. Plot 6 was logged just prior to the 1994 data. Each horizontal line represents a single plant. — — indicates a vegetative condition and — indicates a reproductive condition. nd = no data.

Discussion and Recommendations

Our ability to draw conclusions based on four years of post-harvest monitoring is limited by having only two plots in a logged treatment (6 and 7), and the contrasting responses of these two populations. The population in plot 7 was significantly altered by logging and burning whereas plot 6 showed little effect after the second year. Seedling establishment appears to have been stimulated by logging activities (canopy opening, fire) in the case of plot 7, but not in plot 6. It may be that differences between plots 6 and 7 are related to the post-harvest burn. From photos taken in 1994 it appears that the prescribed fire did not burn through plot 6.

The effects of logging on Henderson's sedge populations were evident in the year following harvest (1994), but populations appeared to recover by the second year (Figure 2). Logging did not drastically alter the demographic profile of populations in the cutting unit, but it did initiate a bout of mortality and recruitment in the case of plot 7, that was not seen in plot 6 or the control plots.

Although some of these monitored populations appear stable, none are very large and there is little reproduction. These populations appear to be near the elevational limits of the species' inland range. Habitat may be marginal in other ways as well, based on size of plants and the populations. Such small, "satellite" populations may not be long-lived. The low number of reproductive plants and high number of young plants in plot 7 makes this clearcut population particularly susceptible to extinction. The future of seedlings is very insecure—they may die later the same year in which they were recorded. Since the amount of seed produced per plant is not great, a low number of reproductive plants could eventually result in loss of the population. The following recommendations are based on this and other monitoring of Henderson's sedge populations on the Clearwater National Forest, and a significant amount of survey work on the species.

- **Refer to the Conservation Plan for the Clearwater Refugium.** For future management decisions affecting this species I would refer to the recommendations in Lichthardt and Moseley (1994). These place a high priority on so-called "source" populations—large populations in optimum habitat. These represent a seed source to replace outlying satellite populations lost due to perturbations or natural extinctions. One concept of metapopulation structure involves such a system of stable, "source" and ephemeral "sink" populations (Pulliam 1988). In the case of Henderson's sedge, a source population would have numerous (more than 30) plants within a half-acre area, including many large plants and a majority of reproductive plants.
- **Identify and protect source populations.** Source populations of Henderson's sedge often occur in moister sites such as drainage bottoms, which are protected by policies requiring stream buffer zones. In the Big Smith area source populations might occur along Big Smith or Little Smith Creeks. Unfortunately, no such populations are known from previous surveys, and what may have been source populations along the Middle Fork Clearwater have been highly disrupted by recreational development.
- **Mitigate effects of timber harvest where possible.** A lack of source populations means that the numerous, small populations like the ones involved in this study are less likely to be replaced if lost. It may be relatively easy to protect populations of Henderson's sedge that will inevitably occur in project areas. For example, a few strategically placed leave-trees could be used to mitigate the effects of canopy removal.

- **Maintain monitoring plots.** One more year of data is called for in the monitoring plan. This will be useful in obtaining post-harvest data from plots 2 and 3. I recommend the plots then remain in place for long-term measurements. The plant communities occupying the clearcuts will continue to change. We have documented the survival of Henderson's sedge populations only through the initial disturbance. It is not known how they will respond to the various seres that will occupy the site over time.

Henderson's sedge is an indicator species for a unique ecosystem determined by a set of climatic and historical factors that are only generally understood. Numerous other species, both rare and common, appear to be dependent on this same habitat, including Pacific dogwood (*Cornus nuttallii*), Constance's bittercress, clustered lady's-slipper orchid and crinkle-awn fescue (*Festuca subuliflora*). The Big Smith drainage has a particular concentration of these coastal disjunct and related species. It has also seen a significant amount of timber harvest. We need to keep in mind that the responses of an individual species to the direct effects of timber harvest are only one aspect of the viability of this ecosystem in the Big Smith drainage.

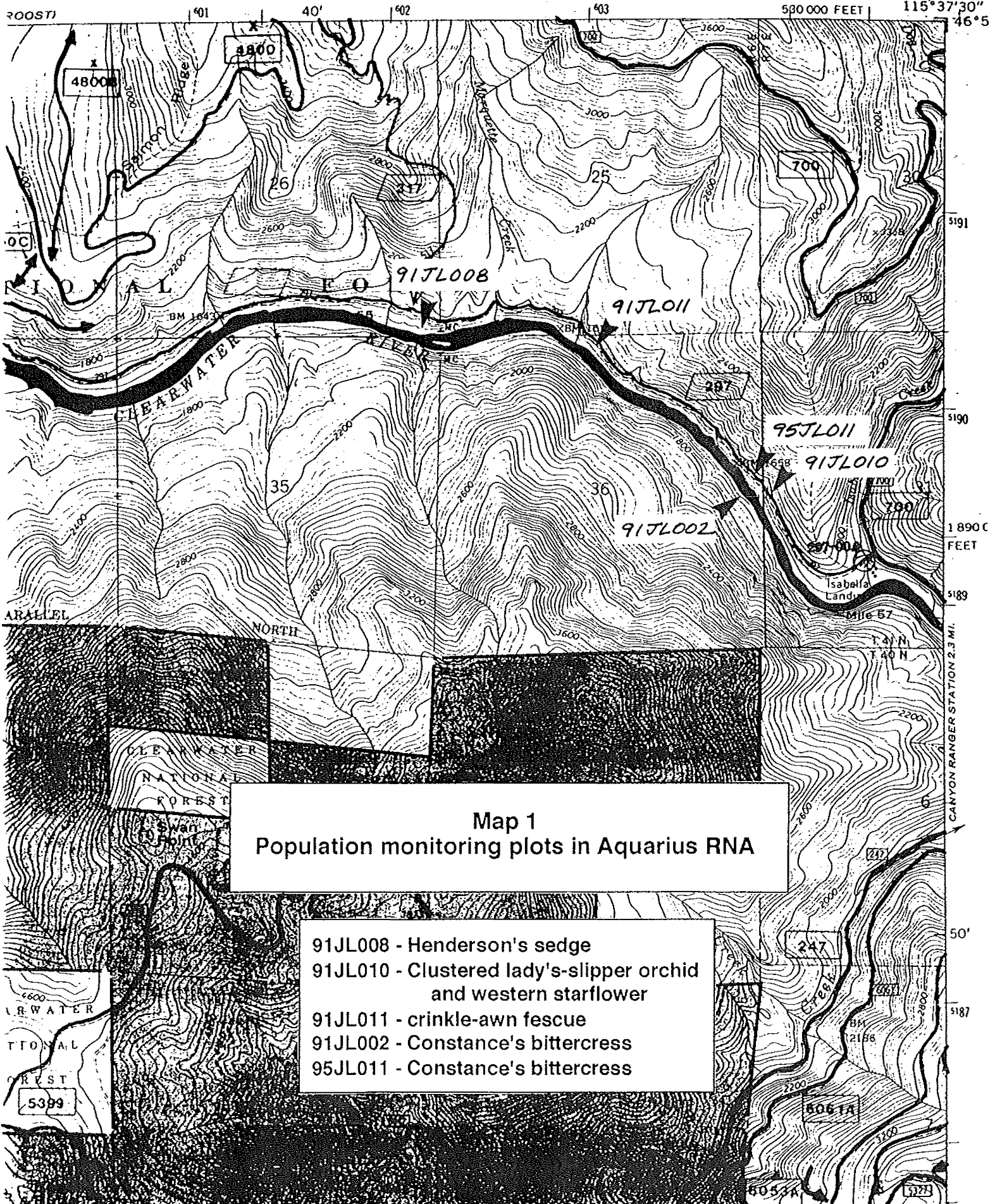
REFERENCES

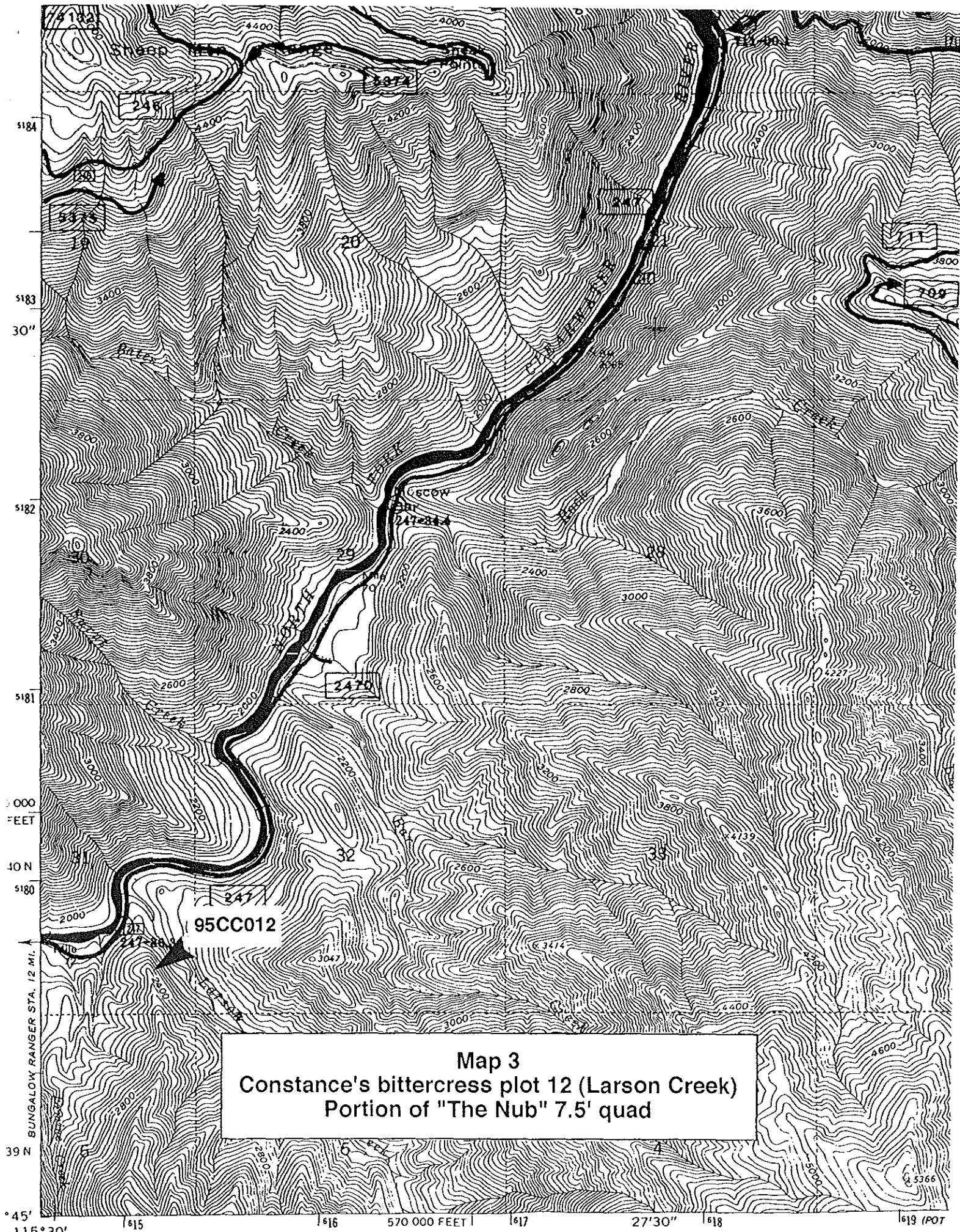
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Appendix A

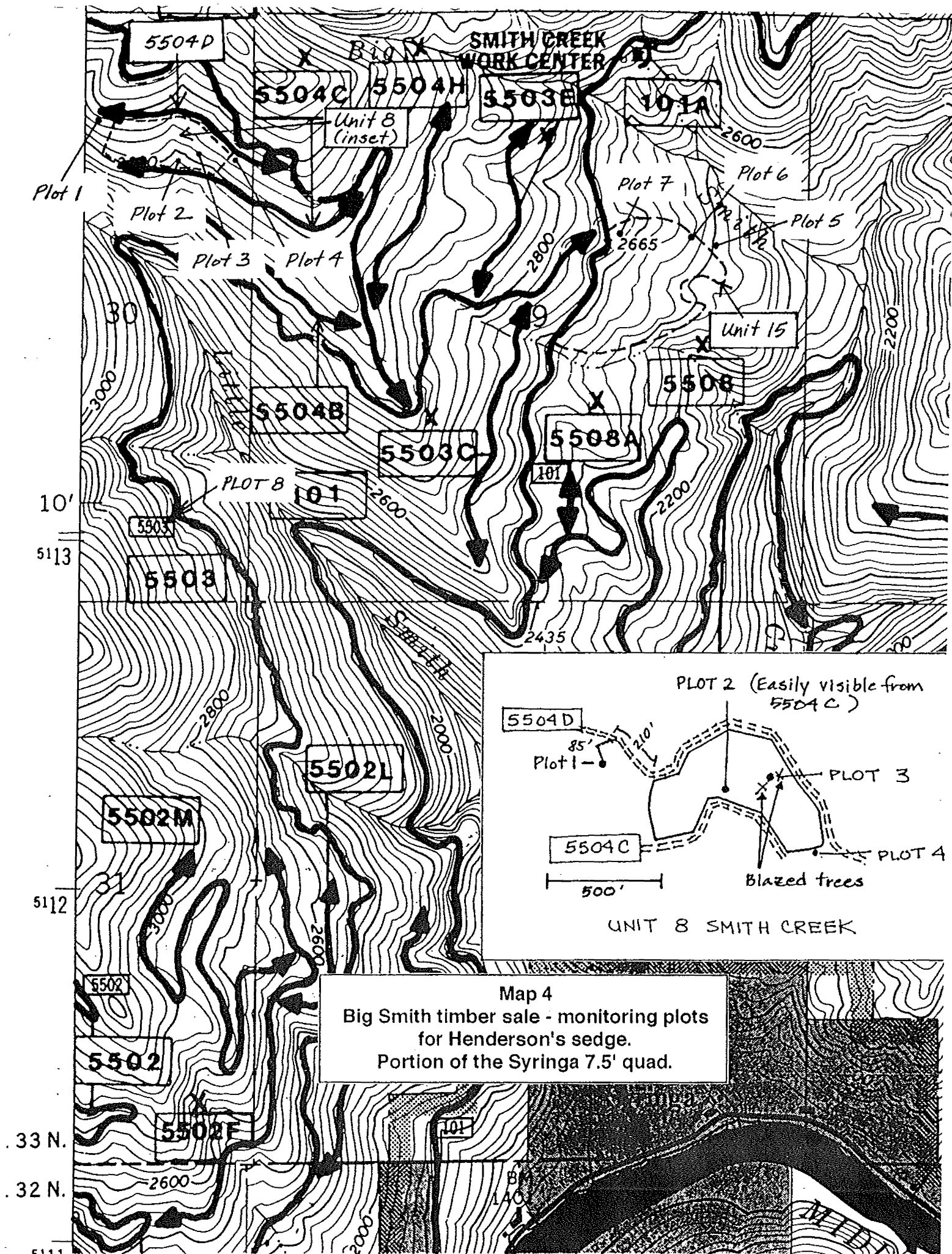
Maps of monitoring plot locations

- Map 1 Monitoring plots in Aquarius RNA for clustered lady's-slipper orchid and western starflower (91JL010), Henderson's sedge (91JL002), and Constance's bittercress (91JL002 and 95JL011)
- Map 2 Constance's bittercress plot 1–Dog-salmon clearcut
- Map 3 Constance's bittercress plot 12–Larson Creek
- Map 4 Big Smith timber sale–monitoring plots for Henderson's sedge



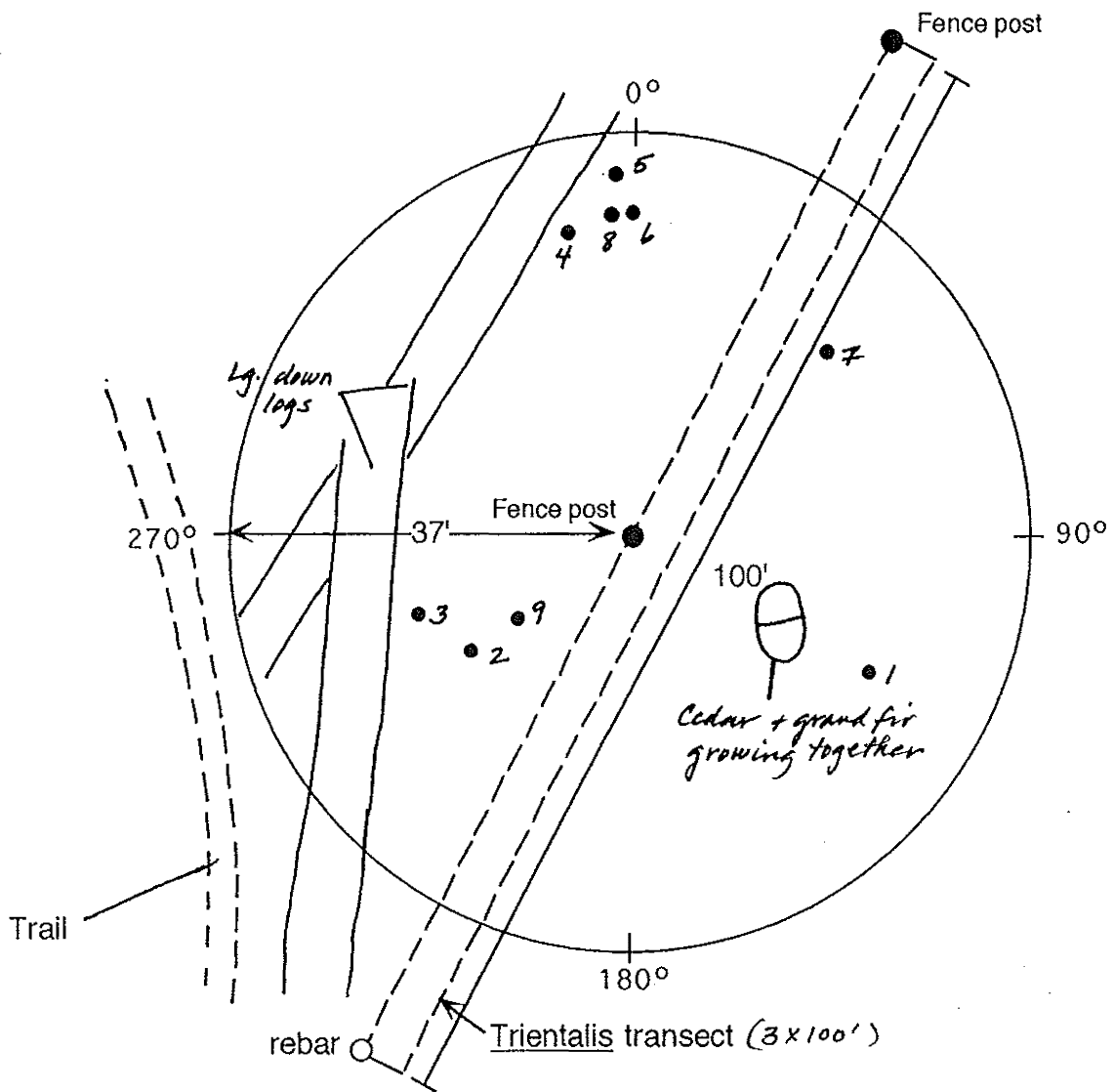


Map 3
Constance's bittercress plot 12 (Larson Creek)
Portion of "The Nub" 7.5' quad

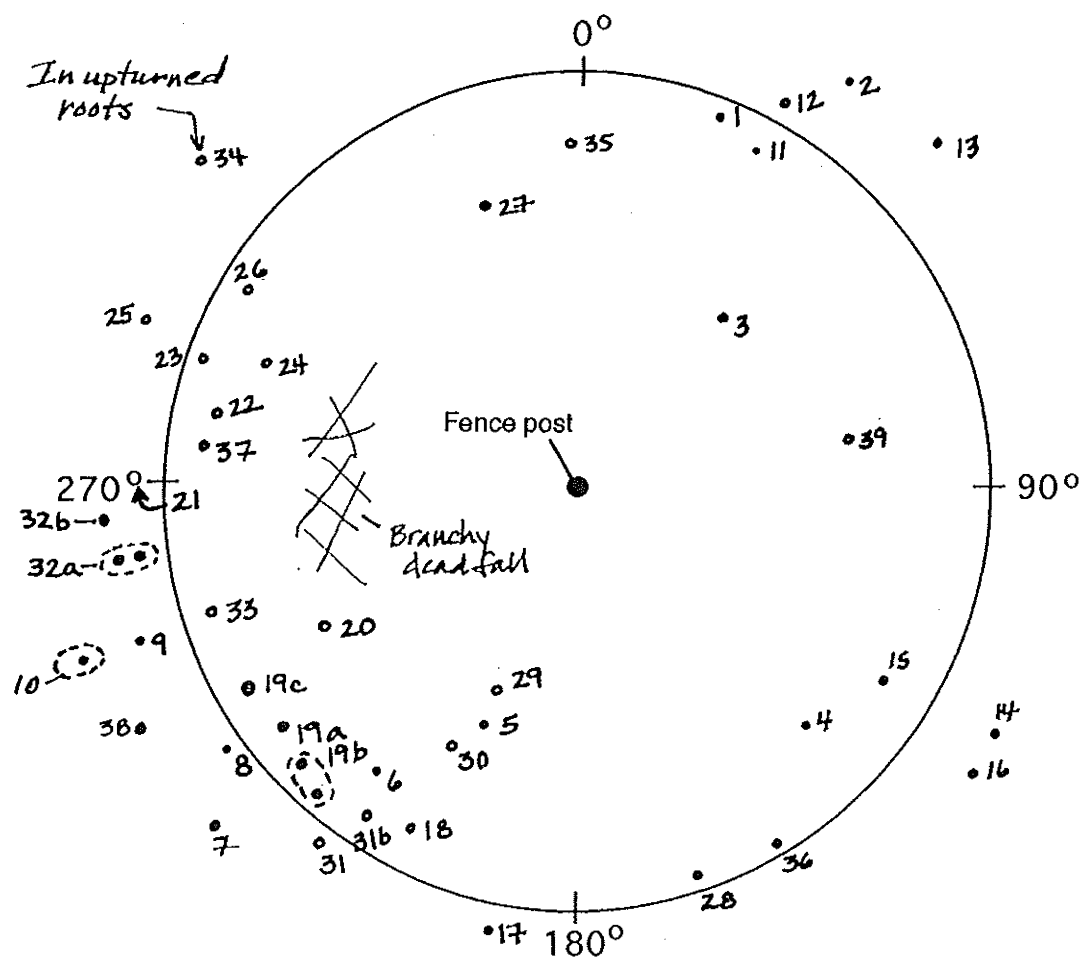


Appendix B

Aquarius RNA: Plot diagrams



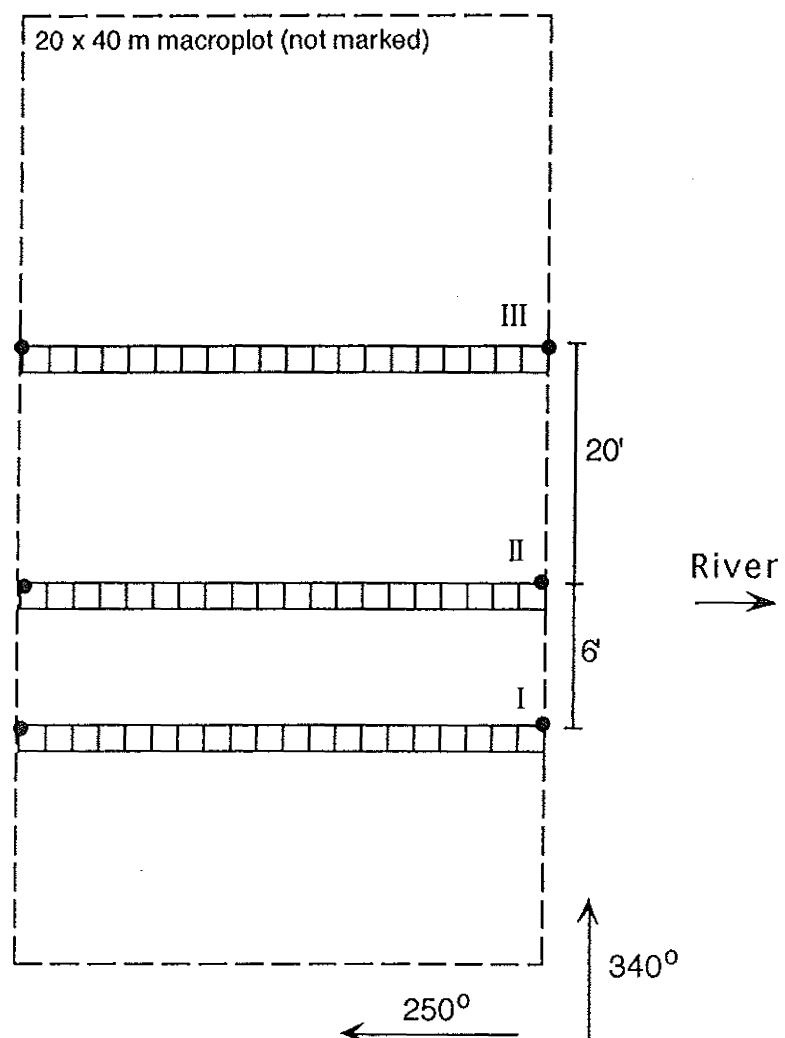
Project: Aquarius RNA
 Species: Cypripedium fasciculatum .038
 Ecodata key i.d.: FS01050391JL010



Project: Aquarius RNA
 Species: *Carex hendersonii* .001
 Ecodata key i.d.: FS01050391JL008

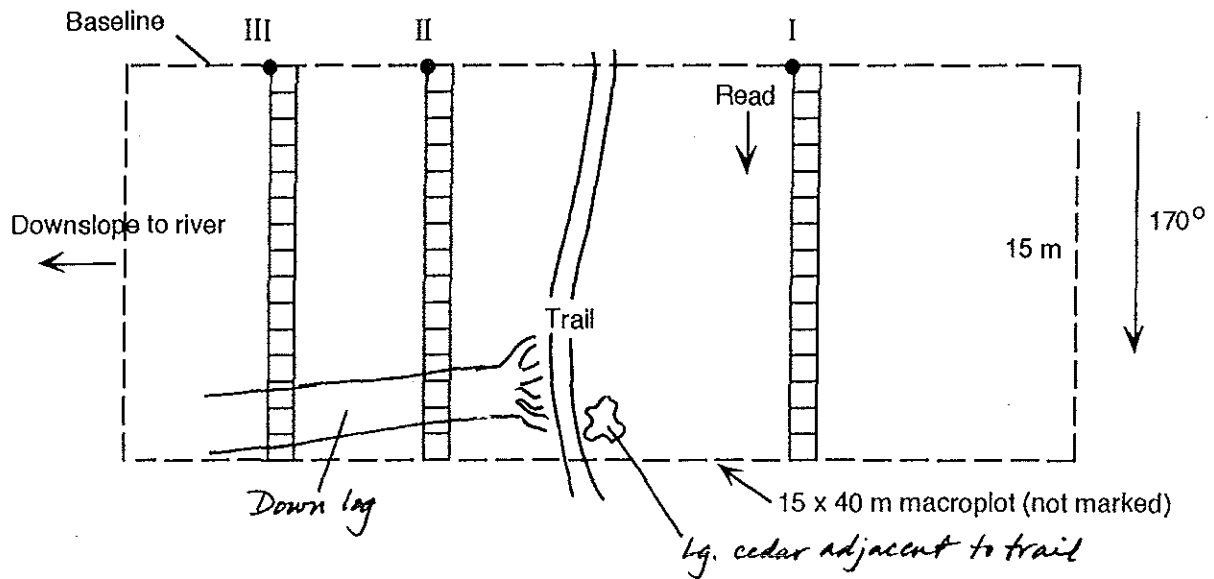
Appendix C

Constance's bittercress: Plot diagrams



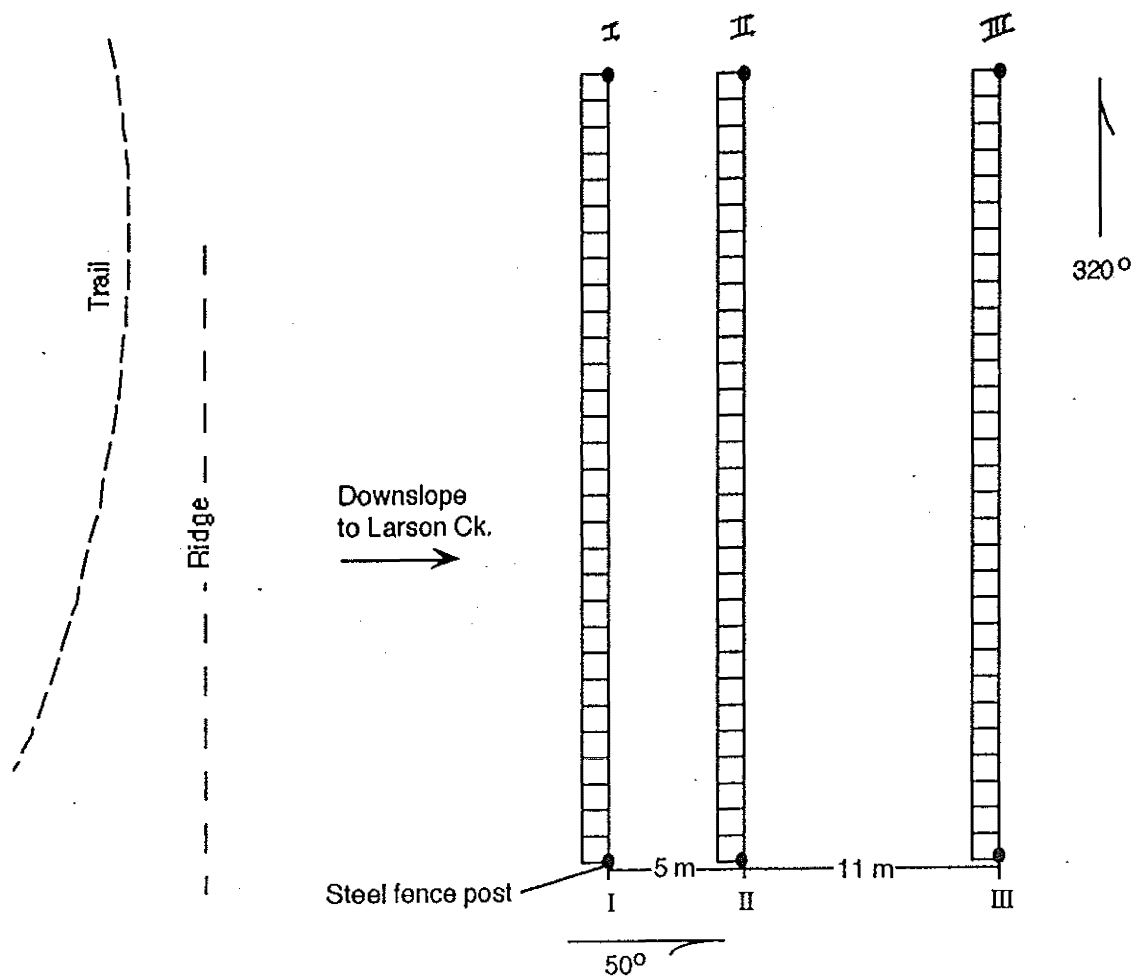
Read microplots from east to west.
 19° E declination used for bearings.

Cardamine constancei
Plot 91JL002
Aquarius-south



Transects run along slope contour.
 Read from north to south on upslope side of tape.
 19° E declination used for bearings.

Cardamine constancei
Plot No. 95CC011
Aquarius-north

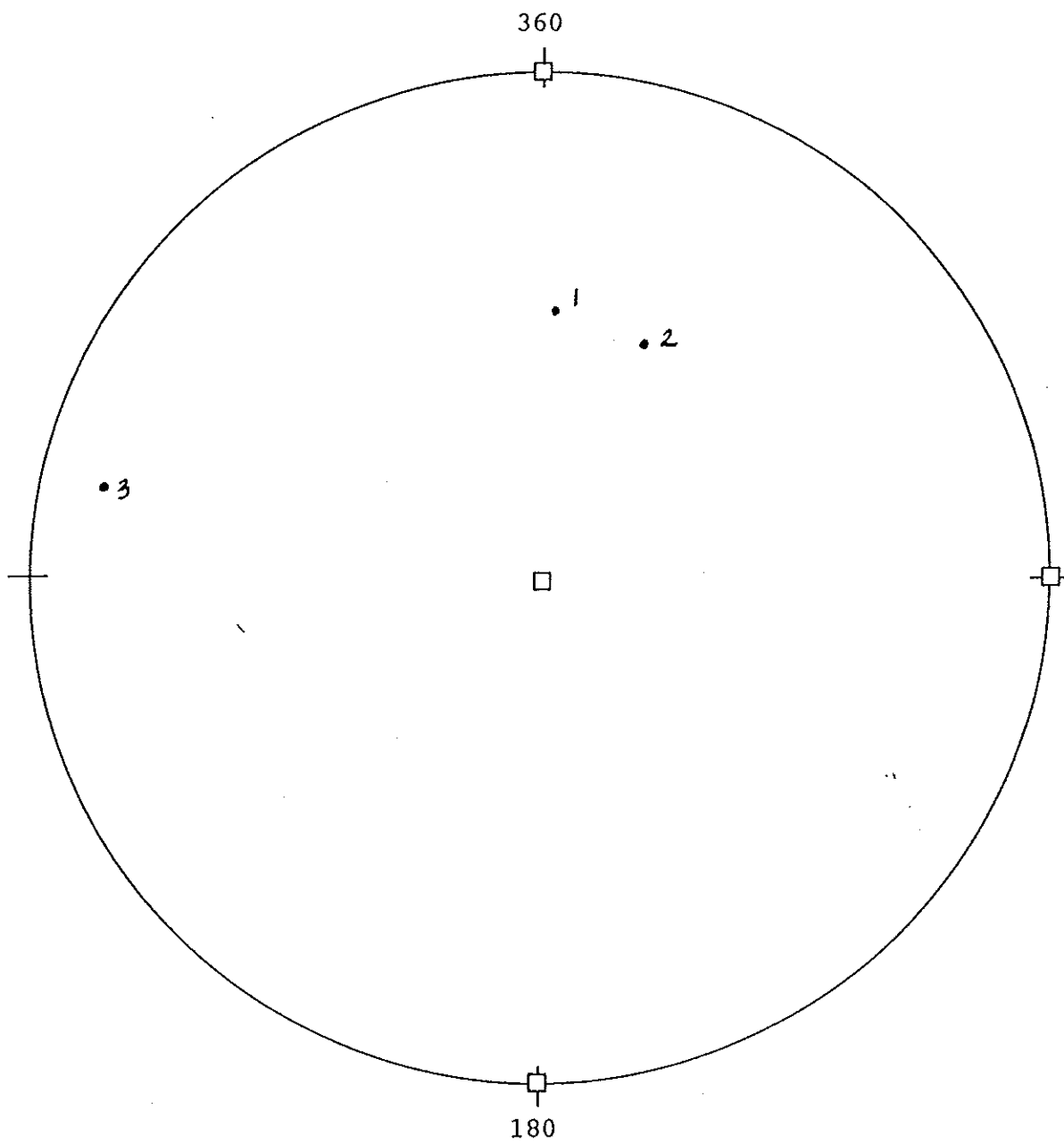


Thirty, contiguous, 1 x 1 m plots along 3 randomly located transects placed on the slope contour.
 Read from SE to NW. 19° E declination used for bearings.

Cardamine constancei
 Plot no. 95CC012
 Larson Creek

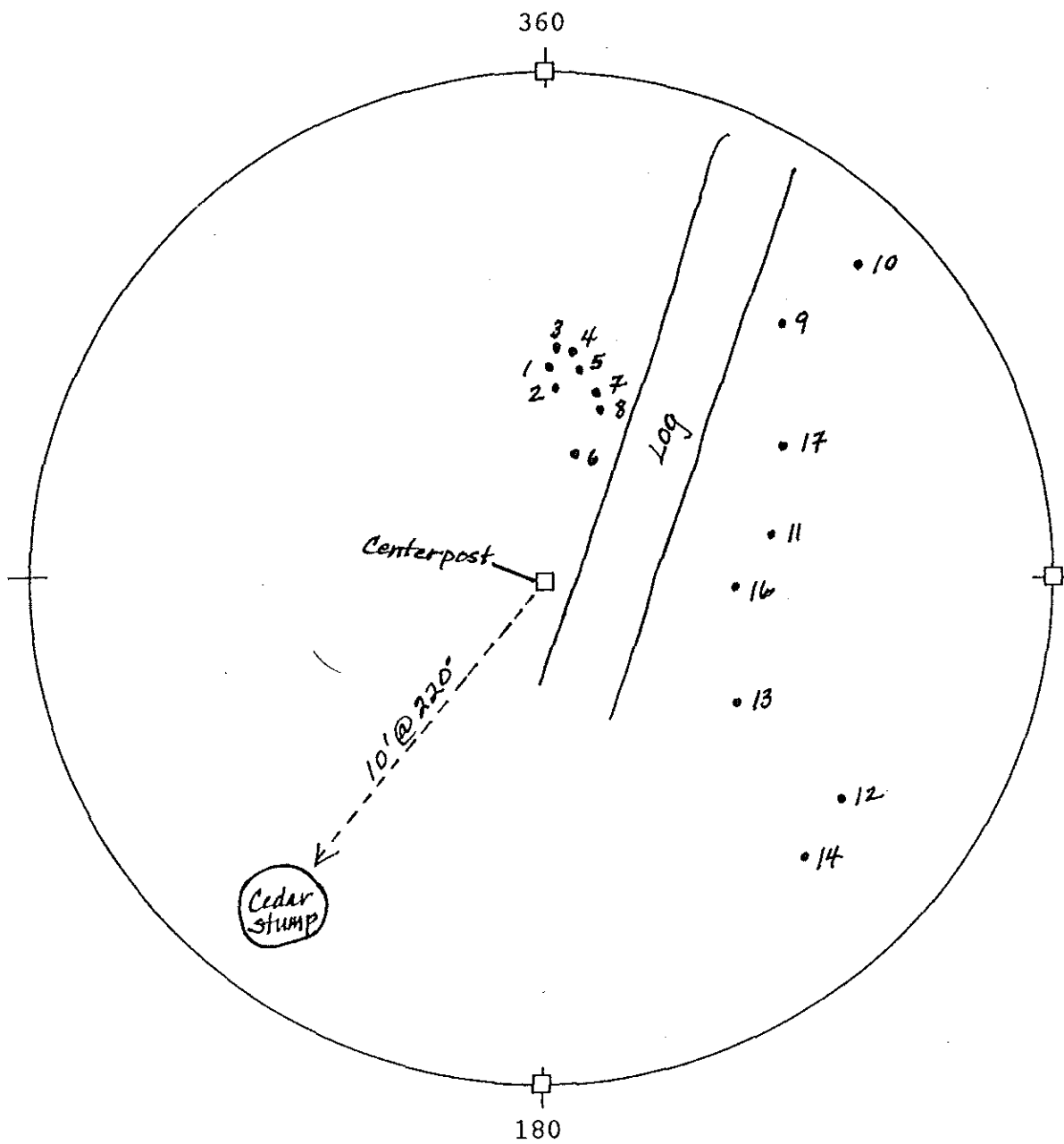
Appendix D

Big Smith timber sale: Plot diagrams



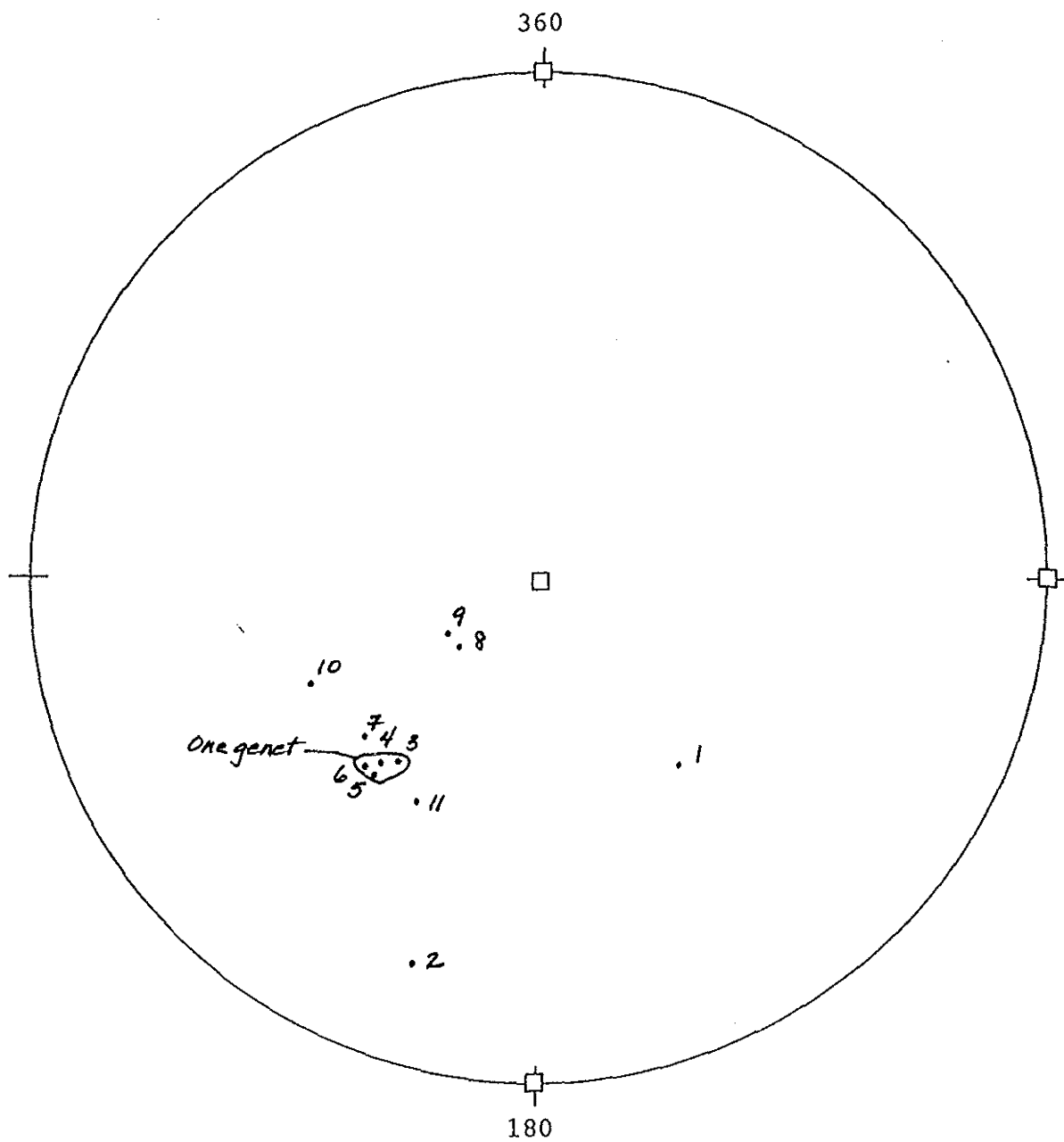
CAREX HENDERSONII
BIG SMITH UNIT 8 PLOT 1, (control)

1/4 in. = 1 ft



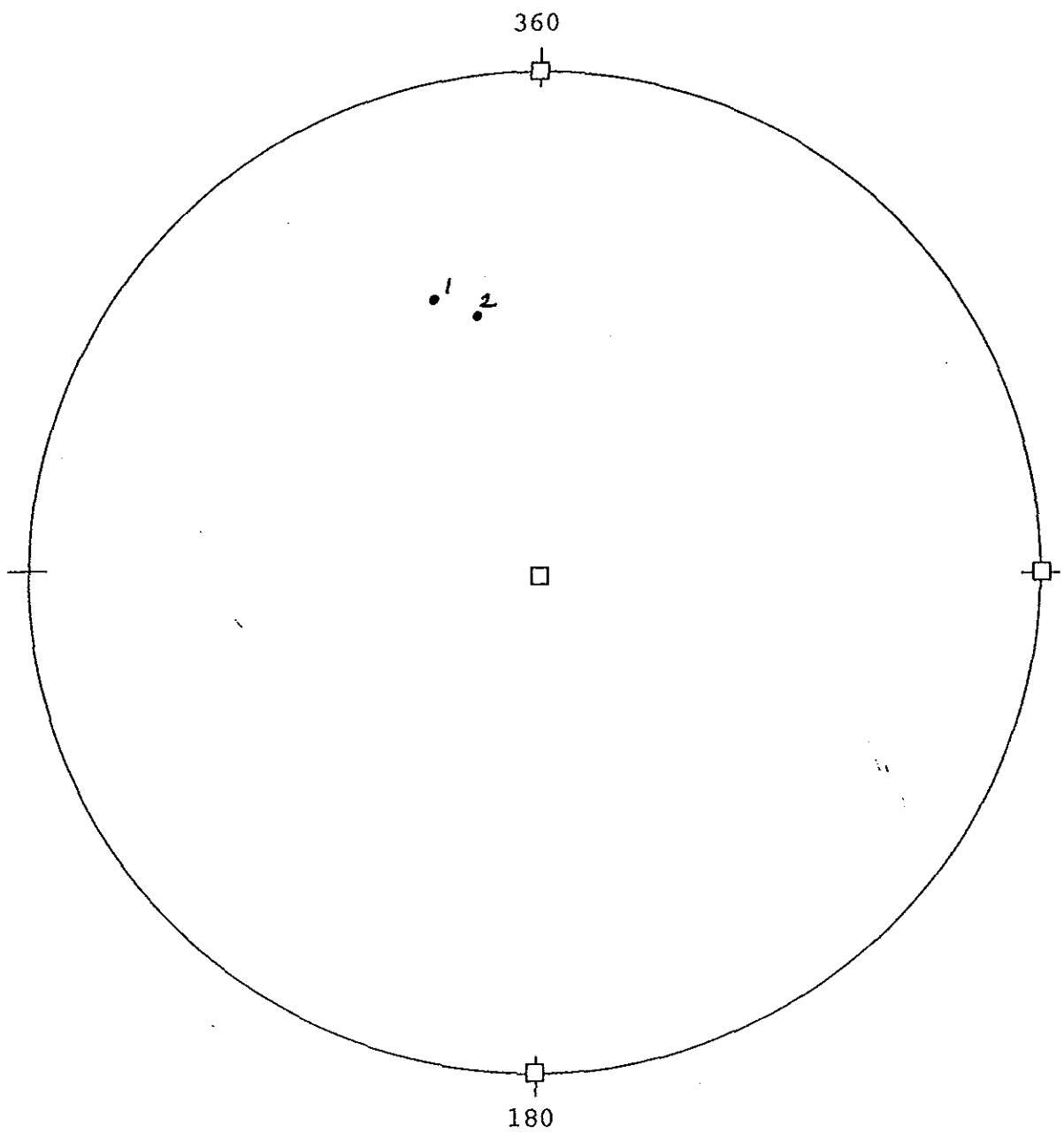
CAREX HENDERSONII
BIG SMITH UNIT 8 PLOT 2

1/4 in. = 1 ft



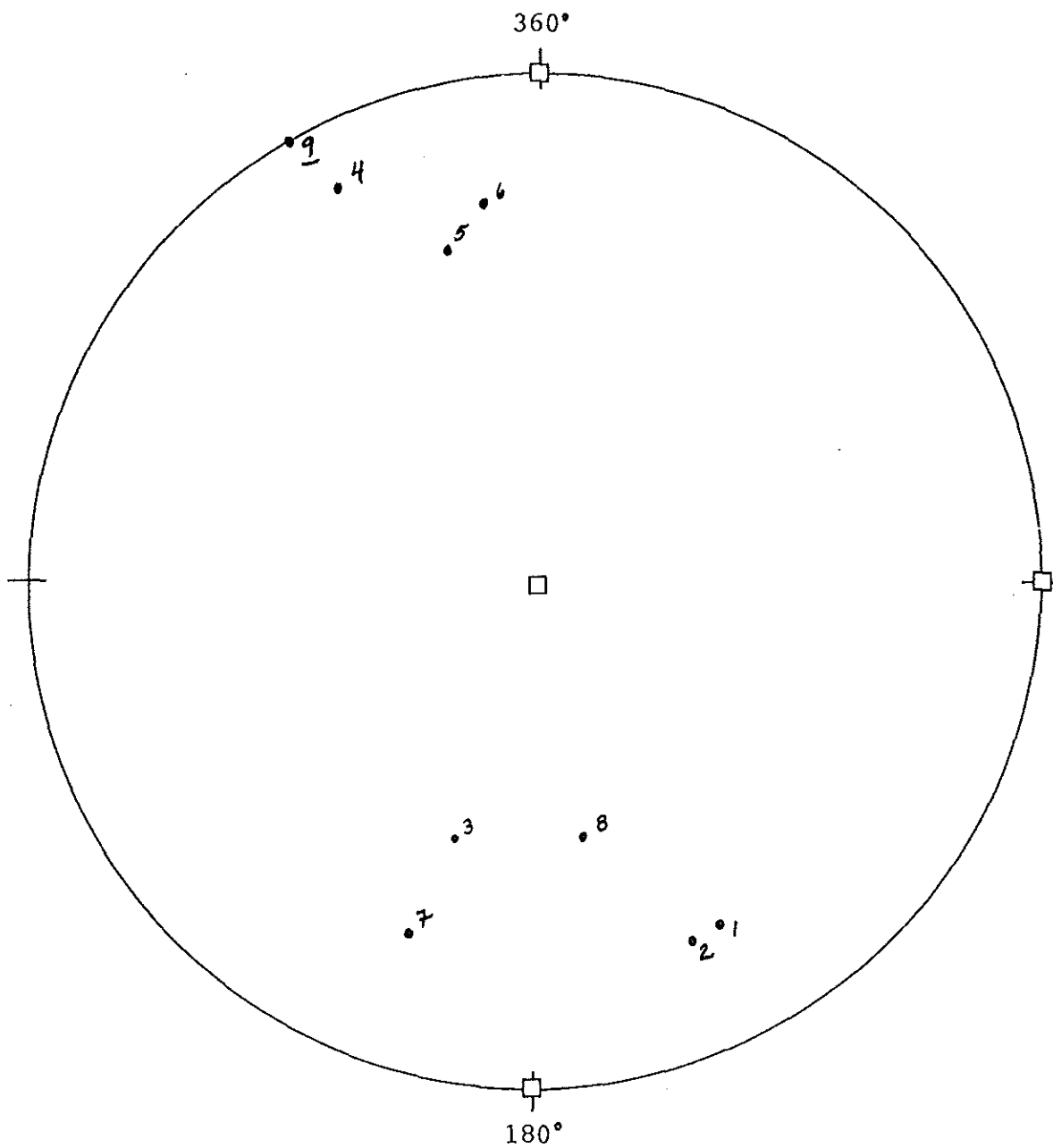
CAREX HENDERSONII
BIG SMITH UNIT 8 PLOT 3

1/4 in. = 1 ft



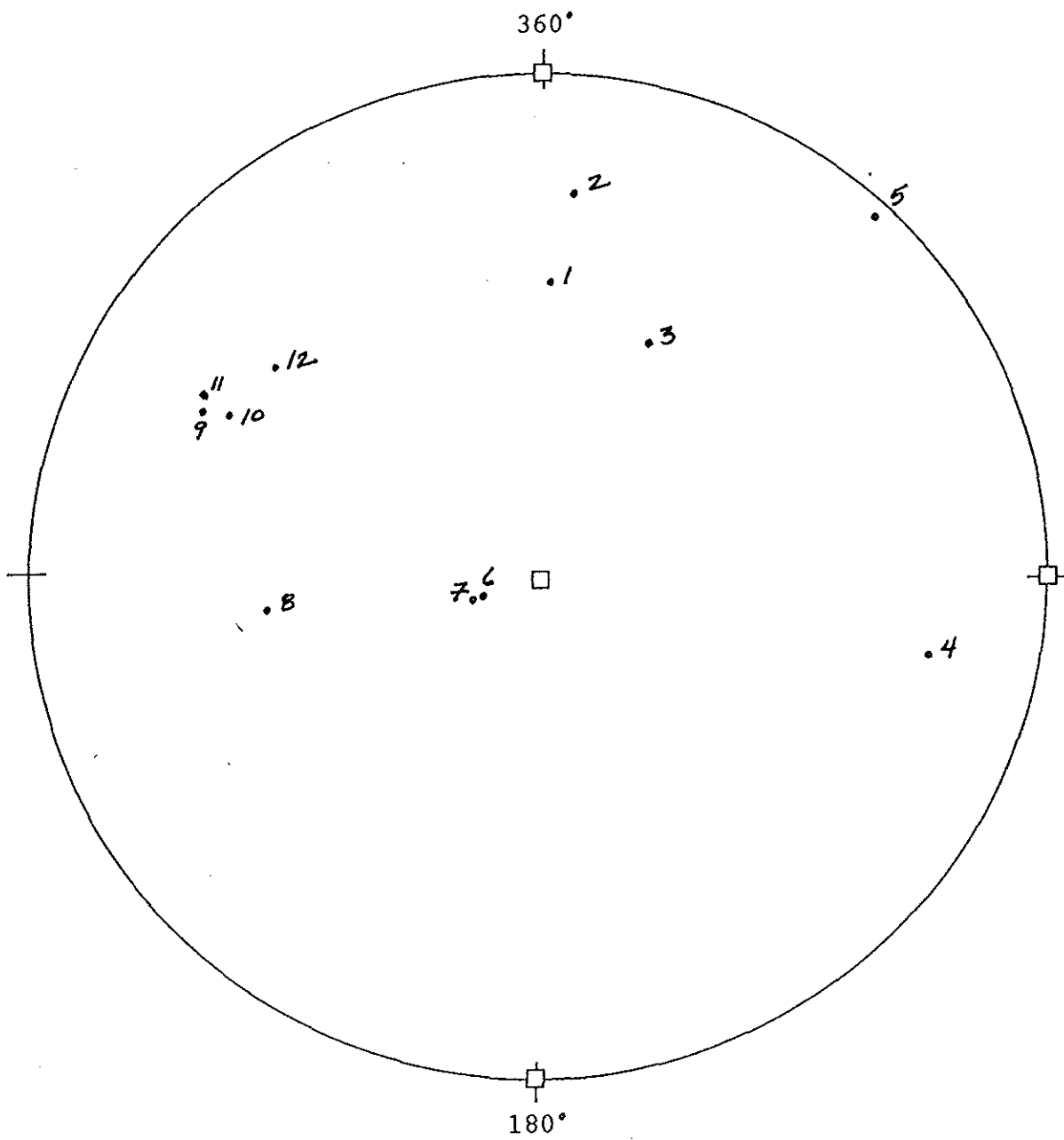
CAREX HENDERSONII
BIG SMITH UNIT 8 PLOT 4 (control)

1/4 in. = 1 ft



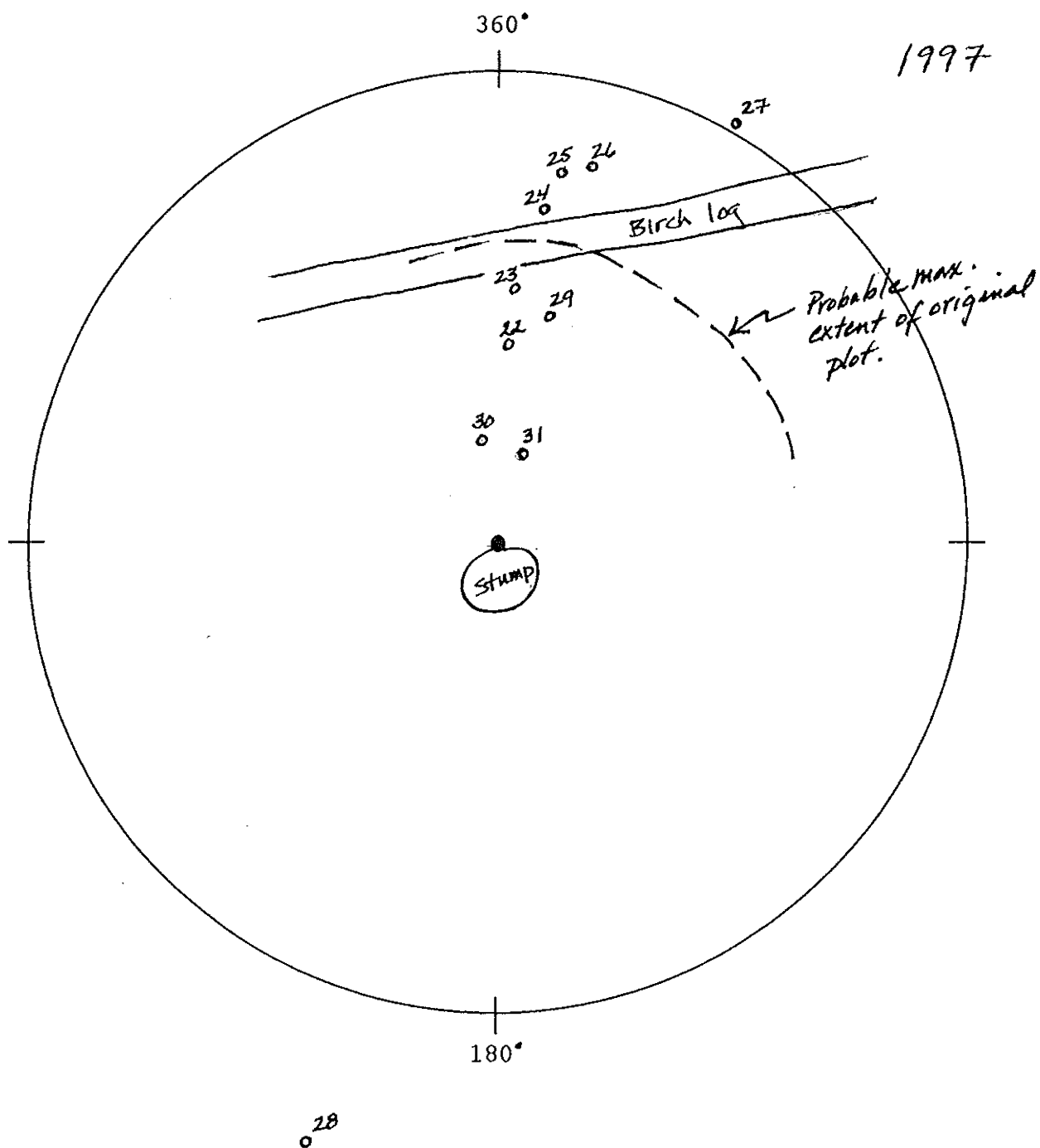
CAREX HENDERSONII
BIG SMITH UNIT 15 PLOT 5

1/4 in. = 1 ft



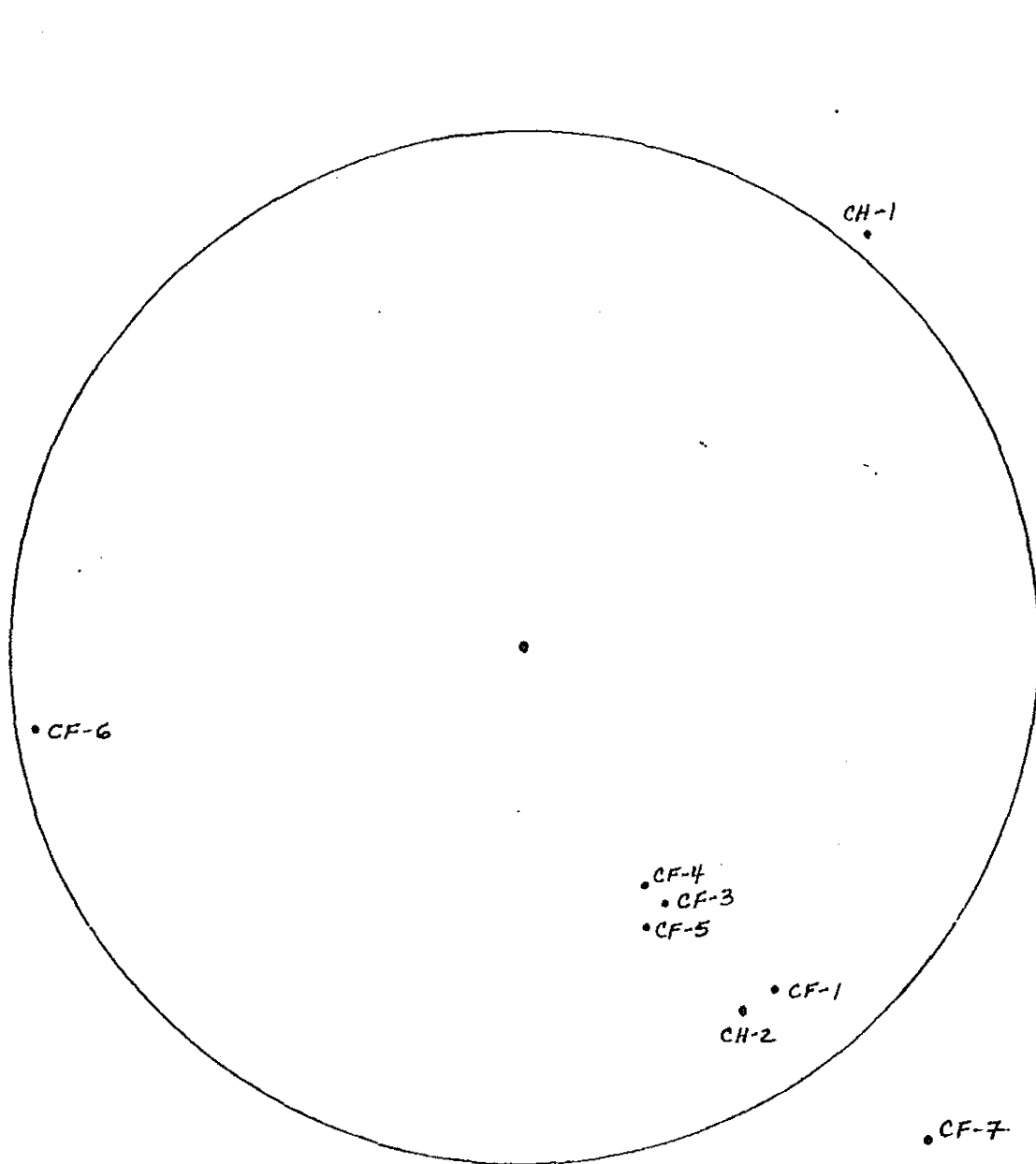
CAREX HENDERSONII
BIG SMITH UNIT 15 PLOT 6

1/4 in. = 1 ft



CAREX HENDERSONII
BIG SMITH UNIT 15 PLOT 7

1/4 in. = 1 ft



CH = *Carex hendersonii*
 CF = *Cypripedium fasciculatum*

PLOT # 8
 SWAN CK. ROAD (CONTROL)

CAREX HENDERSONII

1/4 IN. = 1 FOOT

Appendix E

Datafiles

TITLE: AQUARIUS RNA PLANT POPULATION MONITORING

SPECIES: CYPRIPEDIUM FASCICULATUM

EOR No.: .038

PLOT #: FS01050391JL010

METHOD: 0.1-ac circular plot; 37 ft radius; all individuals present in plot recorded by distance and azimuth from center post (steele fence post). Plants marked with yellow, galvanized spikes in 1995.

LOCATION: Aquarius RNA, just above River trail, ca. 0.5 m west of mouth of Isabella Creek.

LEGAL: 41N,7E,NW of SW, Sec 31

NOTES: M = missing data

FIELDS: Year, month, day, genet no., distance (ft), azimuth, height (ft) , no. of capsules, no. of ramets, notes. M = missing data; - = no plant. Field data on file at Idaho Fish and Game, Conservation Data Center (also includes leaf span measurements).

YR,MO,DY,GENET#,DIST,AZ,HT,#FRTS,#RMTS,NOTES

91	8	7	1	24.0	115	1.5	4	1	leaf blotch
91	8	7	2	18.8	238	1.3	3	1	holes
91	8	7	3	20.0	250	1.4	2	1	
91	8	7	4	28.5	346	1.4	4	1	
91	8	7	5	32.0	358	1.3	5	1	last year's stem present
91	8	7	6	28.7	360	1.3	4	1	healthy
92	6	16	1		-	-	-	-	no plant
92	6	16	2	18.0	243	1.2	4	1	
92	6	16	3	19.5	255	1.3	4	1	
92	6	16	4	29.5	350	1.2	2	1	
92	6	16	5	33.0	360	1.1	6	1	
92	6	16	6		-	-	-	-	no plant
93	8	11	1	23.0	115	0.5	0	1	mutilated
93	8	11	2	18.0	240	1.5	5	1	
93	8	11	3	19.0	250	1.6	5	1	
93	8	11	4	28.5	345	1.2	2	1	
93	8	11	5	32.0	355	1.4	5	1	
93	8	11	6	28.5	360	1.3	4	1	
93	8	11	7	23.0	45	0.7	1	1	
93	8	11	8	28.0	350	0.1	0	1	vegetative
94	6	8	1	25.0	115	0.5	M	1	broken; 8' other side of THPL-ABGR growing together
94	6	8	2	18.0	234	1.0	5	1	
94	6	8	3	20.0	250	0.7	4	1	contorted stem
94	6	8	4	28.5	346	0.8	2	1	
94	6	8	5	32.0	358	0.8	5	1	
94	6	8	6	29.0	360	1.0	5	1	
94	6	8	7	24.0	M	0.2	0	1	vegetative
94	6	8	8	28.3	355	0.5	0	2	vegetative
94	6	8	9	11.5	235	0.8	1	1	
95	6	9	1		115	0.9	2	1	beyond cedar-GF growing together
95	6	9	2		-	-	-	-	no plant
95	6	9	3			0.9	3	1	stem broken; major herbivory
95	6	9	4			-	-	-	no plt; closest to large log based on pink flag

95	6	9	5			-	-	-	no plant
95	6	9	6			-	-	-	no plant; flag
95	6	9	7	24.0	45	0.5	0	1	next to pole cedar
95	6	9	8			0.7	2	1	herbivory
95	6	9	9			0.7	1	1	moderate herbivory; 40% of one leaf
96	6	3	1		115	0.7	4	1	spike present
96	6	3	2		240	0.5	5	1	spike "
96	6	3	3		250	0.8	5	1	spike "
96	6	3	4			-	-	-	no plant
96	6	3	5			-	-	-	no plant
96	6	3	6	29.5	360	0.5	4	1	no spike
96	6	3	7		47	0.7	2	1	spike present
96	6	3	8			-	-	-	no plant
97	6	17	1			-	-	-	buried under windthrow debris
97	6	17	2			1.0	3	1	spike
97	6	17	3			1.1	4	1	spike
97	6	17	4			-	-	-	not located
97	6	17	5			0.15	0	3	no spike
97	6	17	6	29	360	0.5	2	1	spike
97	6	17	7			0.7	1	1	spike--pole cedar is down
97	6	17	8	28	354	0.2	0	2	spike
97	6	17	9			0.8	2	1	spike

TITLE: AQUARIUS RNA PLANT POPULATION MONITORING

SPECIES: *Carex hendersonii*

PLOT #: FS01050391JL008

METHOD: Circular, subjectively located plot with permanent center stake; 45-ft radius.
Distance and azimuth measured to each "colony" or group of individuals from center stake; 19 deg. east declination used for bearings.

LEGAL: T41N, R6E, Sec 26, SE QS, SE QQS

LOCATION: east end of large river terrace.

NOTES: Colonies were staked beginning in 1995, if a plant was present.

FIELDS: year,month,day,colony number,distance in ft,azimuth,number of genets,number of tillers(#ST),number of reproductive tillers (culms;#R). M=missing data; in the genets column, 0 = stake found but no plants, - = no stake or plants found. "-" in the distance and azimuth columns means they were not remeasured.

UPDATED: 2/19/98

YR	MO	DY	#	DIST	AZ	GTS	#ST	# R	Notes
91	7	12	1	34.5	20	1	6	0	
91	7	12	2	41.5	33	2	M	M	
91	7	12	2	41.5	33	2	M	M	
91	7	12	3	18.0	40	4	3	1	
91	7	12	3	18.0	40	4	5	1	
91	7	12	3	18.0	40	4	3	1	
91	7	12	3	18.0	40	4	1	1	
91	7	12	4	28.7	136	3	1	1	
91	7	12	4	28.7	136	3	1	1	
91	7	12	4	28.7	136	3	2	0	
91	7	12	5	21.0	200	1	2	0	
91	7	12	6	30.0	214	4	2	0	
91	7	12	6	30.0	214	4	1	0	
91	7	12	6	30.0	214	4	1	0	
91	7	12	6	30.0	214	4	1	0	
91	7	12	7	42.4	226	6	5	1	
91	7	12	7	42.4	226	6	4	0	
91	7	12	7	42.4	226	6	4	1	
91	7	12	7	42.4	226	6	6	0	
91	7	12	7	42.4	226	6	3	0	
91	7	12	7	42.4	226	6	1	0	
91	7	12	8	37.6	233	2	1	1	
91	7	12	8	37.6	233	2	5	3	
91	7	12	9	39.7	250	2	2	0	
91	7	12	9	39.7	250	2	2	0	
91	7	12	10	44.8	250	1	6	1	
92	6	17	1	34.5	20	2	5	0	
92	6	17	1	34.5	20	2	6	1	
92	6	17	2	41.5	33	1	8	2	
92	6	17	3	17.5	40	3	9	1	Side of mound, btwn post and downed log.
92	6	17	3	17.5	40	3	10	2	
92	6	17	3	19.0	40	3	11	4	
92	6	17	4	28.7	136	3	3	1	Base of alder snag.
92	6	17	4	28.7	136	3	2	1	

YR	MO	DY	#	DIST	AZ	GTS	#ST	# R	Notes
92	6	17	4	28.7	136	3	3	0	
92	6	17	5	20.5	193	1	2	1	Game trail
92	6	17	6	30.0	210	6	4	0	Other side of 2 down logs.
92	6	17	6	30.0	210	6	2	0	seedling
92	6	17	6	30.0	210	6	1	0	seedling?
92	6	17	6	30.0	210	6	3	0	
92	6	17	6	30.0	210	6	3	0	
92	6	17	6	30.0	210	6	1	0	seedling
92	6	17	7	42.0	230	7	1	0	
92	6	17	7	42.0	230	7	4	0	same genet?
92	6	17	7	42.0	230	7	4	0	
92	6	17	7	42.0	230	7	5	1	
92	6	17	7	42.0	230	7	1	0	CARDEW?
92	6	17	7	42.0	230	7	1	0	seedling
92	6	17	7	42.0	230	7	8	3	
92	6	17	8	37.6	233	8	-	-	Not relocated
92	6	17	9	40.0	250	3	5	0	Beyond THPL snag
92	6	17	9	40.0	250	3	1	0	
92	6	17	9	40.0	250	3	1	0	
92	6	17	10	45.0	250	M	M	M	
92	6	17	11	33.0	27	2	3	1	
92	6	17	11	33.0	27	2	2	1	
92	6	17	12	37.5	28	1	2	1	
92	6	17	13	42.0	45	3	7	2	Was here last yr; beyond log
92	6	17	13	42.0	45	3	3	1	
92	6	17	13	42.0	45	3	1	0	
92	6	17	14	41.0	120	2	5	2	under ADPE
92	6	17	14	41.0	120	2	3	1	
92	6	17	15	30.5	122	1	3	1	
92	6	17	16	41.5	125	3	11	2	game trail
92	6	17	16	41.5	125	3	6	2	
92	6	17	16	41.5	125	3	2	1	
92	6	17	17	39.5	190	1	2	0	
92	6	17	18	32.5	205	2	3	0	Next to mossy log
92	6	17	18	32.5	205	2	3	0	
92	6	17	19a	32.5	230	9	4	1	'91 leaves present
92	6	17	19a	32.5	230	9	4	1	
92	6	17	19a	32.5	230	9	4	0	
92	6	17	19a	32.5	230	9	2	1	
92	6	17	19a	32.5	230	9	6	2	
92	6	17	19a	32.5	230	9	2	0	
92	6	17	19a	32.5	230	9	4	3	
92	6	17	19a	32.5	230	9	1	0	CARDEW? tiny
92	6	17	19a	32.5	230	9	7	3	
92	6	17	20	25.0	240	2	4	0	At base of THPL, W side;
92	6	17	20	25.0	240	2	5	4	Present in '91.
92	6	17	21	38.0	270	6	5	1	Against 7" log.
92	6	17	21	38.0	270	6	2	0	
92	6	17	21	38.0	270	6	1	0	
92	6	17	21	38.0	270	6	3	0	
92	6	17	21	38.0	270	6	4	2	

YR	MO	DY	#	DIST	AZ	GTS	#ST	# R	Notes
92	6	17	21	38.0	270	6	1	0	
92	6	17	22	32.0	280	2	3	0	In dense Galium beyond
92	6	17	22	32.0	280	2	3	0	branchy downfall.
92	6	17	23	35.0	288	3	1	0	At base of lg. THPL
92	6	17	23	35.0	288	3	9	3	
92	6	17	23	35.0	288	3	9	5	
92	6	17	24	29.0	290	2	4	0	seedlings?; dense Galium.
92	6	17	24	29.0	290	2	1	0	

93	6	18	1	-	-	-	-	-	Not relocated
93	6	18	2	-	-	1	6	3	
93	6	18	3	-	-	4	8	3	
93	6	18	3	-	-	4	13	5	
93	6	18	3	-	-	4	11	9	
93	6	18	3	-	-	4	1	0	
93	6	18	4	-	-	3	2	1	Base of alder snag
93	6	18	4	-	-	3	7	3	
93	6	18	4	-	-	3	1	0	
93	6	18	5	-	-	-	-	-	Not relocated
93	6	18	6	-	-	4	4	1	
93	6	18	6	-	-	4	4	3	
93	6	18	6	-	-	4	2	1	
93	6	18	6	-	-	4	1	0	
93	6	18	7	-	-	1	3	1	
93	6	18	8	-	-	3	2	0	
93	6	18	8	-	-	3	2	2	
93	6	18	8	-	-	3	4	2	
93	6	18	9	-	-	3	3	1	
93	6	18	9	-	-	3	2	0	
93	6	18	9	-	-	3	1	0	
93	6	18	10	-	-	5	3	1	
93	6	18	10	-	-	5	6	2	
93	6	18	10	-	-	5	2	1	
93	6	18	10	-	-	5	2	0	
93	6	18	10	-	-	5	1	0	
93	6	18	11	-	-	-	-	-	Not relocated
93	6	18	12	36.5	25	1	2	0	5' away from #2
93	6	18	13	-	-	-	-	-	Not relocated
93	6	18	14	-	-	-	-	-	Not relocated
93	6	18	15	-	-	-	-	-	Not relocated
93	6	18	16	-	-	-	-	-	Not relocated
93	6	18	17	-	-	-	-	-	Not relocated
93	6	18	18	-	-	-	-	-	Not relocated
93	6	18	19b	33.5	225	5	2	0	
93	6	18	19b	33.5	225	5	2	0	
93	6	18	19b	33.5	225	5	4	1	
93	6	18	19b	33.5	225	5	5	1	
93	6	18	19b	35.0	220	5	3	1	
93	6	18	20	25.5	240	2	6	3	
93	6	18	20	25.5	240	2	7	3	
93	6	18	21	37.0	270	6	8	5	Downed limbs btwn stake

YR	MO	DY	#	DIST	AZ	GTS	#ST	# R	Notes
93	6	18	21	37.0	270	6	7	3	& colony; dist. may be off
93	6	18	21	37.0	270	6	3	0	
93	6	18	21	37.0	270	6	2	0	
93	6	18	21	37.0	270	6	7	1	
93	6	18	21	37.0	270	6	8	4	
93	6	18	22	-	-	-	-	-	Not relocated
93	6	18	23	-	-	-	-	-	Not relocated
93	6	18	24	-	-	-	-	-	Not relocated
93	6	18	25	40.0	290	1	31	26	In upturned root ball
93	6	18	26	34.0	300	1	6	3	
93	6	18	27	26.0	340	6	13	6	
93	6	18	27	26.0	340	6	8	6	
93	6	18	27	26.0	340	6	2	0	
93	6	18	27	26.0	340	6	6	2	
93	6	18	27	26.0	340	6	3	0	
93	6	18	27	26.0	340	6	11	6	

94	6	13	1	34.5	20	-	-	-	Not relocated.
94	6	13	2	41.5	32	2	1	1	
94	6	13	2	41.5	32	2	5	5	
94	6	13	3	18.0	45	4	15	10	
94	6	13	3	18.0	45	4	10	6	
94	6	13	3	18.0	45	4	12	7	
94	6	13	3	18.0	45	4	3	1	
94	6	13	4	28.0	147	2	5	1	Base of alder snag.
94	6	13	4	28.0	147	2	9	5	
94	6	13	5	21.0	200	-	-	-	Not relocated
94	6	13	6	28.5	210	5	4	1	
94	6	13	6	28.5	210	5	1	0	
94	6	13	6	28.5	210	5	1	0	
94	6	13	6	28.5	210	5	3	0	
94	6	13	6	28.5	210	5	4	1	
94	6	13	7	42.5	226	-	-	-	Not relocated
94	6	13	8	38.0	240	4	3	0	
94	6	13	8	38.0	240	4	5	3	
94	6	13	8	38.0	240	4	3	1	
94	6	13	8	38.0	240	4	2	0	
94	6	13	9	40.0	250	-	-	-	Not relocated
94	6	13	10	45.0	250	-	-	-	Not relocated
94	6	13	11	33.0	27	-	-	-	Not relocated
94	6	13	12	36.5	29	2	4	1	
94	6	13	12	36.5	29	2	2	2	
94	6	13	13	43.0	45	2	3	1	
94	6	13	13	43.0	45	2	5	4	
94	6	13	14	38.0	116	4	11	4	
94	6	13	14	38.0	116	4	17	7	
94	6	13	14	38.0	116	4	2	0	
94	6	13	14	38.0	116	4	1	0	
94	6	13	15	31.0	128	1	3	1	
94	6	13	16	41.5	125	-	-	-	Not relocated
94	6	13	17	39.5	190	-	-	-	Not relocated

YR	MO	DY	#	DIST	AZ	GTS	#ST	#R	
94	6	13	18	32.5	205	-	-	-	Not relocated
94	6	13	19b	34.5	224	1	3	0	
94	6	13	19b	-	-	-	-	-	Not relocated
94	6	13	19c	33.0	238	2	3	0	
94	6	13	19c	33.0	238	2	4	1	
94	6	13	20	25.5	242	3	5	4	
94	6	13	20	25.5	242	3	6	2	
94	6	13	20	25.5	242	3	3	1	
94	6	13	21	38.5	270	7	13	5	
94	6	13	21	38.5	270	7	4	0	
94	6	13	21	38.5	270	7	7	2	
94	6	13	21	38.5	270	7	11	0	
94	6	13	21	38.5	270	7	5	1	
94	6	13	21	38.5	270	7	4	0	
94	6	13	21	38.5	270	7	8	3	
94	6	13	22	33.0	289	5	2	0	
94	6	13	22	33.0	289	5	1	0	
94	6	13	22	33.0	289	5	3	1	
94	6	13	22	33.0	289	5	5	1	
94	6	13	22	33.0	289	5	1	0	
93	6	13	23	35.0	288	-	-	-	Not relocated
94	6	13	24	29.0	290	-	-	-	Not relocated
94	6	13	25	40.0	300	1	48	19	On upturned rootball.
94	6	13	26	34.0	300	1	4	2	
94	6	13	27	26.7	340	5	7	2	
94	6	13	27	26.7	340	5	6	2	
94	6	13	27	26.7	340	5	10	2	
94	6	13	27	26.7	340	5	2	0	
94	6	13	27	26.7	340	5	7	2	
94	6	13	28	36.0	162	1	4	1	
94	6	13	29	18.0	200	1	2	0	
94	6	13	30	24.5	205	1	1	1	
94	6	13	31	38.5	215	1	2	0	
94	6	13	32a	40.0	260	7	4	1	Beyond branchy deadfall.
94	6	13	32a	40.0	260	7	2	0	
94	6	13	32a	40.0	260	7	2	1	
94	6	13	32a	40.0	260	7	1	0	
94	6	13	32a	40.0	260	7	2	1	
94	6	13	32a	38.5	260	7	6	5	
94	6	13	32b	41.0	265	7	8	3	
94	6	13	33	34.0	250	1	1	0	Beyond cedar snag.
94	6	13	34	43.0	310	1	17	11	In upturned root ball.
94	6	13	35	29.6	358	1	5	1	
95	6	16	1	-	-	-	-	-	No plant
95	6	16	2	-	-	2	4	3	
95	6	16	2	-	-	2	3	1	
95	6	16	3	-	-	4	5	1	
95	6	16	3	-	-	4	11	6	
95	6	16	3	-	-	4	6	5	
95	6	16	3	-	-	4	6	2	

YR	MO	DY	#	DIST	AZ	GTS	#ST	# R	Notes
95	6	16	4	-	-	2	11	6	
95	6	16	4	-	-	2	2	1	
95	6	16	5	-	-	-	-	-	No plant
95	6	16	6	30.0	210	3	5	2	
95	6	16	6	-	-	3	1	1	
95	6	16	6	-	-	3	1	0	
95	6	16	7	-	-	2	1	0	
95	6	16	7	-	-	2	1	0	
95	6	16	8	37.0	-	3	2	0	
95	6	16	8	-	-	3	4	1	
95	6	16	8	-	-	3	2	0	
95	6	16	9	-	-	2	9	5	Beyond branchy THPL deadfall
95	6	16	9	-	-	2	6	2	
95	6	16	10	43.0	250	11	2	0	Beyond snag and colony of 3 sq. m.
95	6	16	10	-	-	11	2	0	
95	6	16	10	-	-	11	3	2	
95	6	16	10	-	-	11	2	0	
95	6	16	10	-	-	11	8	3	
95	6	16	10	-	-	11	4	2	
95	6	16	10	-	-	11	3	1	
95	6	16	10	-	-	11	1	0	
95	6	16	10	-	-	11	1	0	
95	6	16	10	48.0	250	11	1	0	
95	6	16	10	-	-	11	2	1	
95	6	16	11	-	-	1	1	0	
95	6	16	12	-	-	2	3	3	
95	6	16	12	-	-	2	3	2	
95	6	16	13	-	-	4	3	2	
95	6	16	13	-	-	4	7	3	
95	6	16	13	-	-	4	4	0	
95	6	16	13	-	-	4	3	1	
95	6	16	14	40.5	116	5	18	3	#14 > 1sq m
95	6	16	14	-	-	5	8	1	
95	6	16	14	-	-	5	6	4	
95	6	16	14	-	-	5	3	1	
95	6	16	14	-	-	5	4	1	Several farther out not counted
95	6	16	15	-	-	1	5	3	
95	6	16	16	-	-	-	-	-	No plant
95	6	16	17	-	-	2	3	0	More plts farther out-not counted
95	6	16	17	-	-	2	6	0	
95	6	16	18	-	-	-	-	-	No plant
95	6	16	19c	-	-	2	3	1	Beyond downed wood
95	6	16	19c	-	-	2	3	1	
95	6	16	20	-	-	2	5	2	Base of medium THPL
95	6	16	20	-	-	2	5	3	
95	6	16	21	-	-	6	8	4	Tight group
95	6	16	21	-	-	6	4	3	
95	6	16	21	-	-	6	2	0	
95	6	16	21	-	-	6	2	1	
95	6	16	21	-	-	6	8	7	
95	6	16	21	-	-	6	6	0	

YR	MO	DY	#	DIST	AZ	GTS	#ST	# R	Notes
95	6	16	22	-	-	-	-	-	No plant
95	6	16	23	-	-	-	-	-	No plant
95	6	16	24	-	-	-	-	-	No plant
95	6	16	25	-	-	2	17	8	On upturned rootball
95	6	16	25	-	-	2	1	0	
95	6	16	26	-	-	-	-	-	No plant
95	6	16	27	-	-	4	3	2	
95	6	16	27	-	-	4	7	3	
95	6	16	27	-	-	4	8	3	
95	6	16	27	-	-	4	6	0	
95	6	16	28	35.5	175	1	4	1	At base of large THPL
95	6	16	29	-	-	1	2	0	
95	6	16	30	-	-	1	3	0	Between 2 rotting logs
95	6	16	31a	38.5	215	1	3	2	
95	6	16	31b	34.5	212	2	2	0	
95	6	16	31b	34.5	212	2	1	0	Tree between post and plant
95	6	16	32	-	-	-	-	-	Not relocated
95	6	16	33	-	-	1	2	1	Behind snag
95	6	16	34	-	-	-	-	-	Not relocated (root ball)
95	6	16	35	-	-	1	6	1	Base of ABGR
95	6	16	36	36.0	150	2	6	0	Appears to be first-year plant
95	6	16	36	36.0	150	2	3	2	
95	6	16	37	33.0	275	2	2	1	Flagged
95	6	16	37	33.0	275	2	3	1	
96	6	26	1	-	-	-	-	-	Not found since '92
96	6	26	2	-	-	3	4	1	Closest ramets are 18" from stake
96	6	26	2	-	-	3	3	1	
96	6	26	2	-	-	3	1	0	
96	6	26	3	-	-	3	9	4	
96	6	26	3	-	-	3	6	3	
96	6	26	3	-	-	3	4	0	
96	6	26	4	-	-	1	2	2	
96	6	26	5	-	-	-	-	-	Not found since '92
96	6	26	6	-	-	1	1	0	> 12" from post
96	6	26	7	-	-	1	2	1	Several plts ca. 6' farther out
96	6	26	8	-	-	5	6	4	
96	6	26	8	-	-	5	3	1	
96	6	26	8	-	-	5	4	2	
96	6	26	8	-	-	5	4	1	
96	6	26	8	-	-	5	1	0	
96	6	26	9	-	-	4	9	5	
96	6	26	9	-	-	4	2	0	
96	6	26	9	-	-	4	1	0	
96	6	26	9	-	-	4	1	0	
96	6	26	10	48.0	250	4	4	4	Changed from "37c"
96	6	26	10	48.0	250	4	3	2	
96	6	26	10	48.0	250	4	5	5	
96	6	26	10	48.0	250	4	3	3	
96	6	26	11	-	-	1	2	1	
96	6	26	12	-	-	2	2	2	plts beyond 12 are @ 44'-not recorded

YR	MO	DY	#	DIST	AZ	GTS	#ST	# R	Notes
96	6	26	12	-	-	2	2	1	
96	6	26	13	-	-	3	3	1	
96	6	26	13	-	-	3	9	3	
96	6	26	13	-	-	3	4	1	2' from stake
96	6	26	14	-	-	6	13	2	
96	6	26	14	-	-	6	6	1	
96	6	26	14	-	-	6	4	3	
96	6	26	14	-	-	6	7	5	
96	6	26	14	-	-	6	3	1	
96	6	26	14	-	-	6	3	0	
96	6	26	15	-	-	2	3	3	
96	6	26	15	-	-	2	2	1	
96	6	26	16	-	-	-	-	-	Not relocated since '92
96	6	26	17	-	-	2	7	4	
96	6	26	17	-	-	2	4	2	
96	6	26	18	-	-	-	-	-	Not relocated
96	6	26	19c	-	-	6	3	0	
96	6	26	19c	-	-	6	2	1	
96	6	26	19c	-	-	6	1	0	C. dewyana or seedling?
96	6	26	19c	-	-	6	1	0	C. dewyana or seedling?
96	6	26	19c	-	-	6	1	0	C. dewyana or seedling?
96	6	26	19c	-	-	6	1	0	Other side of log
96	6	26	20	-	-	3	5	2	
96	6	26	20	-	-	3	1	0	Seedling
96	6	26	20	-	-	3	5	2	
96	6	26	21	-	-	8	5	2	
96	6	26	21	-	-	8	2	0	
96	6	26	21	-	-	8	5	3	
96	6	26	21	-	-	8	5	3	
96	6	26	21	-	-	8	7	2	
96	6	26	21	-	-	8	4	1	
96	6	26	21	-	-	8	1	0	
96	6	26	21	-	-	8	5	0	
96	6	26	22	-	-	-	-	-	Not relocated, never staked
96	6	26	23	-	-	-	-	-	Not relocated, never staked
96	6	26	24	-	-	-	-	-	Not relocated, never staked
96	6	26	25	-	-	-	-	-	Not relocated
96	6	26	26	-	-	-	-	-	Not relocated, never staked
96	6	26	27	-	-	4	7	4	
96	6	26	27	-	-	4	8	7	
96	6	26	27	-	-	4	9	6	
96	6	26	27	-	-	4	2	1	
96	6	26	28	-	-	1	6	4	
96	6	26	29	-	-	1	2	0	
96	6	26	30	-	-	1	4	2	
96	6	26	31a	-	-	1	2	1	
96	6	26	31b	-	-	1	3	0	
96	6	26	32	-	-	-	-	-	Not relocated
96	6	26	33	-	-	1	2	2	
96	6	26	34	-	-	1	4	1	On tip-up mound
96	6	26	35	30	354	2	1	0	

YR	MO	DY	#	DIST	AZ	GTS	#ST	# R	Notes
96	6	26	35	30	354	2	11	7	
96	6	26	36	35	158	1	6	1	
96	6	26	37	32	275	1	5	1	Stake w/no number or "38"
96	6	26	38	43	240	7	10	6	No number on stake
96	6	26	38	43	240	7	5	5	
96	6	26	38	43	240	7	4	3	
96	6	26	38	43	240	7	5	2	
96	6	26	38	43	240	7	2	0	
96	6	26	38	43	240	7	3	1	
96	6	26	38	43	240	7	4	4	
96	6	26	39	24	80	1	9	3	new in '96; under down branches
96	6	26	41	40	248	2	4	2	May be labeled "37" ? ;
96	6	26	41	40	248	2	1	0	Dist. & az coincide w/#9
97	6	18	1	-	-	-	-	-	
97	6	18	2	-	-	1	5	4	
97	6	18	3	-	-	2	8	7	
97	6	18	3	-	-	2	13	6	
97	6	18	4	-	-	1	2	1	
97	6	18	5	-	-	-	-	-	Not relocated-buried under blowdown
97	6	18	6	-	-	2	1	0	
97	6	18	6	-	-	2	2	1	
97	6	18	7	-	-	2	1	0	
97	6	18	7	-	-	2	1	0	
97	6	18	8	-	-	3	5	1	
97	6	18	8	-	-	3	4	1	
97	6	18	8	-	-	3	3	2	
97	6	18	9	-	-	-	-	-	
97	6	18	10	-	-	-	-	-	
97	6	18	11	-	-	1	1	0	
97	6	18	12	-	-	-	-	-	buried under debris
97	6	18	13	-	-	2	4	0	
97	6	18	13	-	-	2	9	4	
97	6	18	14	-	-	-	-	-	buried under debris
97	6	18	15	-	-	-	-	-	buried under debris
97	6	18	16	-	-	-	-	-	buried under debris
97	6	18	17	-	-	2	10	5	
97	6	18	17	-	-	2	4	2	
97	6	18	18	-	-	-	-	-	
97	6	18	19c	-	-	-	-	-	
97	6	18	20	-	-	1	2	2	among deadfall
97	6	18	21	-	-	4	4	2	
97	6	18	21	-	-	4	4	1	
97	6	18	21	-	-	4	5	1	
97	6	18	21	-	-	4	5	2	
97	6	18	22	-	-	-	-	-	
97	6	18	23	-	-	-	-	-	
97	6	18	24	-	-	-	-	-	
97	6	18	25	-	-	-	-	-	
97	6	18	26	-	-	-	-	-	
97	6	18	27	-	-	1	6	3	

YR	MO	DY	#	DIST	AZ	GTS	#ST	# R	Notes
97	6	18	28	-	-	1	4	2	
97	6	18	29	-	-	-	-	-	buried under debris
97	6	18	30	-	-	1	8	2	
97	6	18	31a	-	-	1	2	1	
97	6	18	31b	-	-	1	2	0	
97	6	18	33	-	-	-	-	-	
97	6	18	34	-	-	2	3	1	
97	6	18	34	-	-	2	2	1	
97	6	18	35	-	-	2	1	0	
97	6	18	35	-	-	2	6	2	
97	6	18	36	-	-	1	4	1	
97	6	18	37	-	-	1	6	0	
97	6	18	38	-	-	-	-	-	buried under debris
97	6	18	39	-	-	-	-	-	buried under debris
97	6	18	41	-	-	-	-	-	Same as # 9?
97	6	18	41	-	-	-	-	-	

File = AQ pop mon/Carhen.8.data

Title: *Carex hendersonii*, Big Smith Timber Sale

Not all plants were marked as of 1995, and the azimuths and distances retaken in successive years varied somewhat. Only the initial readings were entered in the data file. 1992 data are only available for plots 1 and 5. The Idaho CDC took over responsibility for data collection in 1995. No data could be found for plot 4, only a 1993 map of the plant locations. Unit 15 (plots 6 and 7) was logged and burned between '93 and '94 data collection. Beginning in 1996, data collection was streamlined by only counting the total number of ramets per genet and the number of reproductive ramets (culms, or inflorescence-bearing ramets).

Plot 7: posts were removed during logging, making it impossible to relocate specific plants. Plants were apparently renumbered in 1994 following logging and burning of the unit. They were renumbered again in 1995. However, groups of plants could be relocated with some confidence and these are indicated by letter designations A to D in the data for 1993-1995.

More than one record for a plant no., in a given year, indicates more than one genet, in close proximity, at that location. M = missing data, - = no plant present.

Fields:

1) Treatment (1=control; 2=not logged as of 6/97; 3=logged in 1993), 2) plot no., 3) year, 4) month, 5) day, 6) plant no. (or colony no. if several genets are very close), 7) azimuth(°), 8) distance from center post (ft), 9) number of leaves, 10) length of longest leaf (ft), 11) number of culms, 12) number of ramets (culms + vegetative tillers; recorded beginning in 1995).

1	2	3	4	5	6	7	8	9	10	11	12
1	1	92	8	31	1	2	6.3	106	1.6	3	
1	1	92	8	31	2	22	6	10	.7	0	
1	1	92	8	31	3	282	10.4	85	1.5	1	
1	1	93	6	30	1	0	6.4	73	1.6	4	
1	1	93	6	30	2	28	5.9	15	1.3	1	
1	1	93	6	30	3	292	10.7	93	1.5	4	
1	1	94	8	16	1			70	1.7	9	
1	1	94	8	16	2			12	1.6	2	
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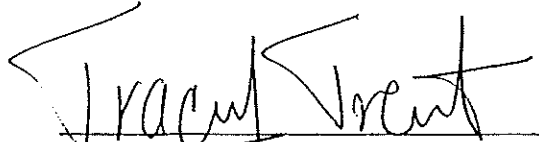
IDAHO DEPARTMENT OF FISH AND GAME

Submitted by:



Robert K. Moseley, Coordinator
Idaho Conservation Data Center

Approved by:



Tracey Trent, Chief
Natural Resources Policy Bureau